R-1250

# TECHNICAL MANUAL

# *SERVICE, CIRCUIT DIAGRAMS, AND ILLUSTRATED PARTS BREAKDOWN*

## AN/GRR-25 RADIO SET

(FSN 5820-899-9975)

(WILCOX)

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# INTRODUCTION

This publication is the official Service Technical Manual for Radio Receiver R-1250/GR, a ground-based radio receiving unit which operates on a single preset channel within the frequency range from 116.00 to 149.95 megacycles. The receiver is used at air traffic control facilities for the reception of amplitude-modulated radiotelephone signals. The receiver is designed for unattended operation and may be either used as an independent unit or operated as part of a vhf communications system employing 50-kilocycle channel spacing. The manual consists of seven chapters bound in one volume. Chapter 1 contains general information and leading particulars; the installation phase is covered in Chapter 2; complete operating instructions are found in Chapter 3; principles of operation are described in Chapter 4; Chapter 5 provides instructions for maintaining and overhauling the receiver; the circuit diagrams are contained in Chapter 6; and an illustrated parts breakdown will be found in Chapter 7.

Applicable publications governing the use of abbreviations, symbols, reference designations, and terms used in this technical manual are as follows:

| | |
|---|---|
| MIL-T-9941 (USAF) | Technical Manuals: Ground C-E Equipment, Facility, Site, and System, Preparation Of |
| MIL-STD-12 | Abbreviations for Use on Drawings and in Technical-Type Publications |
| MIL-STD-15 | Electrical and Electronic Symbols |
| MIL-STD-16 | Electrical and Electronic Reference Designations |
| MIL-STD-280 | Definitions of Terms for Equipment Divisions |

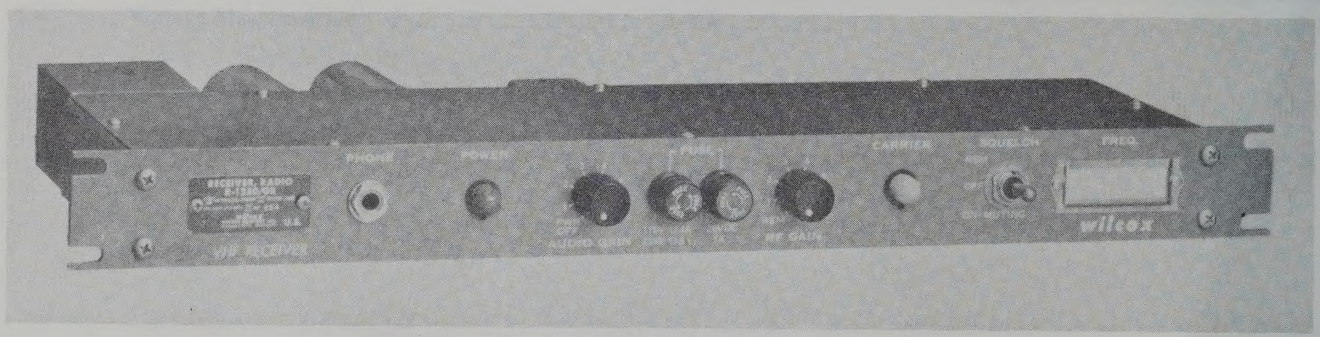



*Figure 1-1. Radio Receiver R-1250/GR*

# CHAPTER 1
# GENERAL INFORMATION

## 1-1. DESCRIPTION AND PURPOSE.

1-2. DESCRIPTION OF EQUIPMENT.

1-3. Radio Receiver R-1250/GR (receiver) is a ground-based, radio-receiving unit that operates on a single preset channel withi nthe frequency range from 116.00 to 149.95 megacycles (mc). The receiver employs a single-conversion superheterodyne circuit with a crystal-controlled oscillator and is a complete, operable unit less antenna, primary power source, remote control equipment, and loudspeaker or headset. Remote control and loudspeaker requirements for the receiver are compatible with FSA-22 and FAA4 remote control equipment.

1-4. The receiver, shown in figure 1-1, is designed for panel mounting in a standard 19-inch equipment rack. Receiver parts are located on a horizontal chassis behind the front panel, and protection is provided at the top and bottom of the chassis by removable equipment covers. All controls, switches, and indicators necessary for operation of the receiver are mounted on the front panel. The controls and switches permit local adjustment of the audio gain, local or remote adjustment of the rf gain/squelch threshold, and local or remote switching to activate or disable the squelch circuit. A headset jack is included on the front panel to permit monitoring of the receiver audio output.

1-5. Mounted on the rear of the chassis is a carrier-operated relay that performs both internal and external control functions. All connections to the receiver are made through a 19-pin connector, an ac power cord, and a coaxial antenna connector on the rear of the chassis. Primary power is normally obtained from a 115-volt, 50- to 400-cps, ac source, but facilities are provided in the receiver for operation from a 230-volt, 50- to 400-cps, ac source or a 27.5-volt battery or dc generator. The receiver also contains a charging circuit to permit trickle recharging of an external battery from either a 115- or 230-volt ac source.

1-6. PURPOSE OF EQUIPMENT.

1-7. Radio Receiver R-1250/GR is used as a ground-based receiver at air traffic control facilities for the reception of amplitude-modulated radiotelephone signals. The receiver is designed for unattended operation and may be either used as an independent unit or operated as part of a vhf communications system employing 50-kilocycle (kc) channel spacing.

## 1-8. INFORMATION AND REFERENCE TABLES.

1-9. Tables 1-1 through 1-4 contain information that will help you to become familiar with all the features and characteristics of the receiver.

*Table 1-1. Leading Particulars*

| | |
|---|---|
| PRIMARY POWER | 115 or 230 volts ac, ±10 percent; 50-400 cps; single phase; 27 watts max<br>or<br>27.5 volts dc, ±10 percent; 14 watts max |
| TRANSPORTABILITY | Light military vehicles |
| PHYSICAL CHARACTERISTICS: | |
| Dimensions (Inches) | 1.72 x 9.50 x 19.00 |
| Weight | 6.4 lb |
| VIBRATION: | |
| Frequency | 15 to 55 cps with a 1.0 to 1.5 cycle-per-second-per-second rate of change |
| Amplitude | 0.015 inch total excursion |
| Duration | 45 minutes along each of three mutually perpendicular planes |
| BOUNCE (Crated) | Average maximum recurring acceleration of 10 g for a duration of 4 hours |
| MECHANICAL STORAGE: | |
| Crated | Any position |
| Uncrated | Upright position only |

*Table 1-2. Capabilities and Limitations*

| | |
|---|---|
| FREQUENCY RANGE | 116.00 to 149.95 mc |
| RECEIVER TYPE | Single conversion superheterodyne type with crystal-controlled local oscillator |
| INTERMEDIATE FREQUENCY | 17 mc |
| FREQUENCY STABILITY | 0.002 percent |
| NUMBER OF CHANNELS | One, pretuned to any frequency within the frequency range of the receiver |
| CHANNEL SPACING | 50 kc |
| SIGNAL TYPE | Unmodulated continuous carrier (A0), amplitude-modulated telephone (A3) |
| INPUT IMPEDANCE | 50 ohms coaxial, unbalanced |
| SENSITIVITY | Minimum of 10-db signal-plus-noise to noise ratio with a 5-hard-microvolt input signal, modulated 30 percent at 400 cps |
| SELECTIVITY | ±15.1 kc wide (min) at 6 db down; ±31.5 kc wide (max) at 60 db down |
| SPURIOUS RESPONSES | At least 80 db down |
| NOISE AND HUM LEVEL | At least 35 db down when the modulation is removed from a 500- or 100,000-microvolt input signal, modulated 30 percent at 1000 cps |
| AUDIO OUTPUT IMPEDANCES: | |
| Main | 600 or 20,000 ohms |
| Low Level | Nominally 600 ohms |
| AUDIO OUTPUT: | |
| Main | 0.01 to 1 watt |
| Low Level | 20 ±3 db down from the main output |
| AUDIO RESPONSE | Less than 3-db total variation from 300 to 3000 cps |
| AUDIO DISTORTION | Will not exceed 15 percent with a 1-volt rf input signal, modulated 30 percent at 400 cps, or exceed 25 percent with a 1-volt rf input signal, modulated 90 percent at 400 cps |
| AGC CONTROL | Less than 3-db variation for input signals from 15 microvolts to 1 volt |
| AGC TIME CONSTANT | Less than 0.10 second |
| SQUELCH THRESHOLD | 3 microvolts or less at maximum rf gain; not less than 60 microvolts at minimum rf gain |
| AMBIENT TEMPERATURES: | |
| Operating | −29 to +60 deg C (−20 to +140 deg F) |
| Nonoperating | −54 to +71 deg C (−65 to +160 deg F) |
| RELATIVE HUMIDITY | 95 to 100 percent |

*Table 1-3. Equipment Supplied*

| OFFICIAL NOMENCLATURE | COMMON NAME | QTY | DESCRIPTION AND PURPOSE |
|---|---|---|---|
| Radio Receiver R-1250/GR | Receiver | 1 | Receives amplitude-modulated radiotelephone signals within vhf frequency range. |

*Table 1-4. Equipment Required But Not Supplied*

| STOCK NUMBER | DESCRIPTION | QTY |
|---|---|---|
| | Antenna, 52 ohms, frequency coverage from 116.00 to 149.95 mc | 1 |
| | Remote Control Equipment, Type FSA-22 or FAA4 (or equivalent) | 1 |
| 5965-280-3629 | Headset, Type NT-49985 | 1 |
| 5905-395-9857 | Attenuator, Fixed, Type UG-529U | 1 |
| 6625-893-0660 | Meter, Frequency, Type AN/USM-26( ) | 1 |
| | Converter, Frequency, Type 525C (Mfr Code No. 28480) | 1 |
| 6625-539-9685 | Generator, Signal, Type AN/USM-44 | 1 |
| 6625-544-8691 | Multimeter, Type ME-26( )/U | 1 |
| 6625-714-3992 | Oscilloscope, Type 545A (Mfr Code No. 80009) | 1 |
| 6625-716-0883 | Preamplifier, Type 53/54A (Mfr Code No. 80009) | 1 |
| 6625-707-8000 | Probe, Attenuator, Type P6000 (Mfr Code No. 80009) | 1 |
| | Amplifier, Power, Signal Generator, Type 230-A (Mfr Code No. 04901) | 1 |
| 6625-556-8958 | Meter, Audio Level, Type TS-399/U | 1 |
| | Test Panel (see figure 5-1) | 1 |
| | Oscillator, Audio, Type AN/URM-127 | 1 |
| 6625-993-3389 | Test Set, Transistor, Type 1890M | 1 |
| | Coaxial test cable, 3 ft long, RG-58/U with UG-88C/U connectors at both ends | 1 |
| | Coaxial test cable, 2 ft long, RG-58/U with a UG-88C/U connector at one end and two alligator clips at other end | 1 |
| | Capacitor, Mica, 10 uuf | 1 |
| | Capacitor, Mica, 1000 uuf | 1 |
| | Capacitor, Electrolytic, 10 uf | 1 |
| | Adapter, Connector, Type UG-349A/U | 2 |
| | Adapter, Connector, Type UG-606/U | 1 |

# CHAPTER 2
# INSTALLATION

2-1. INTRODUCTION. This chapter gives you the information you will need to locate and install the receiver as an operating unit. Section I gives the data you will need for effective installation planning. Section II lists equipment supplied and provides logistic data. Section III gives the installation instructions. Section IV gives the instructions on how to prepare the equipment for reshipment.

## SECTION I
## INSTALLATION PLANNING

### 2-2. LOCATION OF EQUIPMENT.

2-3. The receiver is designed to be installed in a fixed-field radio installation. The receiver must be housed in an enclosed area and be provided with a primary power source, antenna, headset, interconnecting cables, remote control equipment, and loudspeaker.

### 2-4. RECEIVER MOUNTING REQUIREMENTS.

2-5. The receiver is designed to be mounted in a standard 19-inch equipment rack. Mounting data and space requirements for installing the receiver in the equipment rack can be determined from the receiver outline dimensions shown in figure 2-1. Ample space should be provided at the rear of the equipment rack for installation of interconnecting cables, and a minimum space of 12 inches should be provided at the front of the rack for installation and removal of the receiver.

### 2-6. POWER REQUIREMENTS.

2-7. The receiver can be operated on either ac or dc primary power. Receiver power requirements are as follows:

115 or 230 volts ac, ±10 percent; 50 to 400 cps; three-wire single phase; 27 watts maximum

or

27.5 volts dc, ±10 percent; 14 watts maximum

2-8. Primary ac power should be obtained from base or commercial sources. Primary dc power should be obtained from a battery or dc generator. If desired, the ac and dc power sources can be connected to the receiver simultaneously, with the dc source serving as an auxiliary supply. When a battery is connected as the auxiliary supply and the receiver is operating from the ac source, the battery receives a constant trickle charge from the power supply in the receiver.

**Caution**

When using an ac power source and a dc generator simultaneously, the dc generator *must* be turned on during the time that the ac power is turned on, or the dc generator will place an excessive load on the receiver power supply. This may damage the power supply or cause fuse F2 to blow.

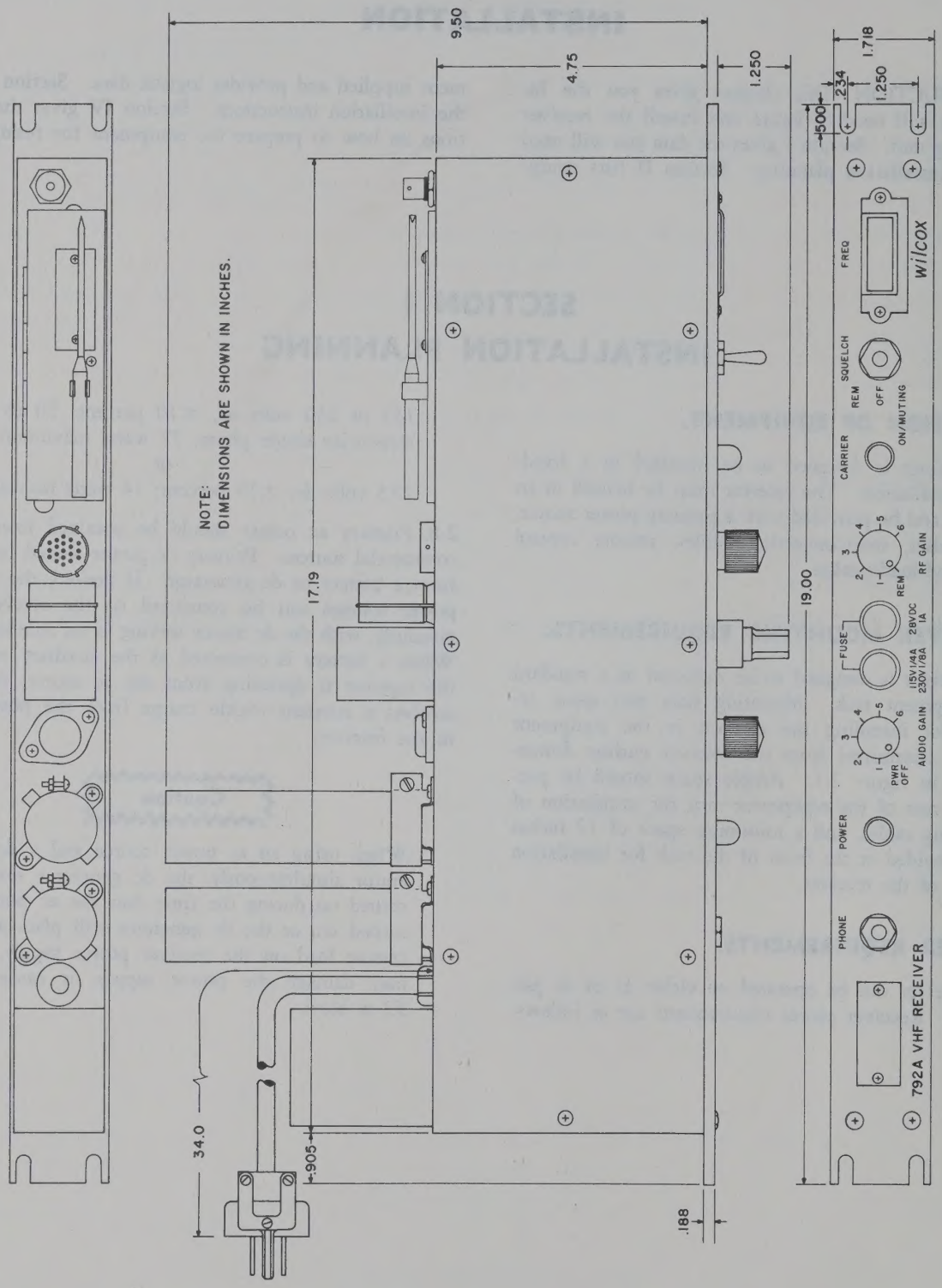



*Figure 2-1. Radio Receiver R-1250/GR, Outline Dimensions*

# SECTION II
# LOGISTICS

2-9. INTRODUCTION. This section lists equipment supplied and gives packing material handling instructions. Information concerning fabrication of interconnecting cables is also given.

## 2-10. EQUIPMENT SUPPLIED.

2-11. The receiver is supplied as a single unit in one shipping case as listed in table 2-1.

## 2-12. MATERIAL HANDLING.

2-13. The receiver may be transported over short distances without crating and is small enough for transport in light military vehicles.

## 2-14. CABLE REQUIREMENTS.

2-15. The antenna cable and the interconnecting cable between the receiver and remote control circuits, loudspeaker, and the primary dc power source are not supplied and must be fabricated. The ac power cable is supplied as part of the equipment and is permanently attached to power transformer T3 in the receiver.

## 2-16. CABLE FABRICATION.

2-17. ANTENNA CABLE. The antenna cable should be fabricated from RG-58/U coaxial cable, using the connector type shown for plug P3 in figure 2-2. Length of the antenna cable is determined by the distance between the receiver and the antenna. The type of connector to be used on the opposite end of the cable is determined by the receptacle on the antenna.

2-18. INTERCONNECTING CABLE. The connector type shown for plug P2 in figure 2-2 is required for fabrication of the interconnecting cable. Wire connector P2 as shown in figure 2-2, using the pins designated for the audio output and control functions required by the particular loudspeaker and remote control circuits.

2-19. If a battery or dc generator is to be used as either the primary power source or as an auxiliary supply, make connections to the dc input pins on connector P2 as shown in figure 2-2. Size of wire and/or cable to be used for fabrication of the interconnecting cable is determined by circuit functions and by the length of the cable. Terminations used on the remote end of the cable are determined by the output terminations on the remote equipment.

*Table 2-1. Equipment Supplied*

| BOX NO. | DIMENSIONS (INCHES) | | CRATED WEIGHT (POUNDS) | CONTENTS | QTY |
|---|---|---|---|---|---|
| | CRATED | UNCRATED | | | |
| 1/1 | 5 x 13 x 20.5 | 1.72 x 9.50 x 19.00 | 16.00 | Radio Receiver R-1250/GR | 1 |

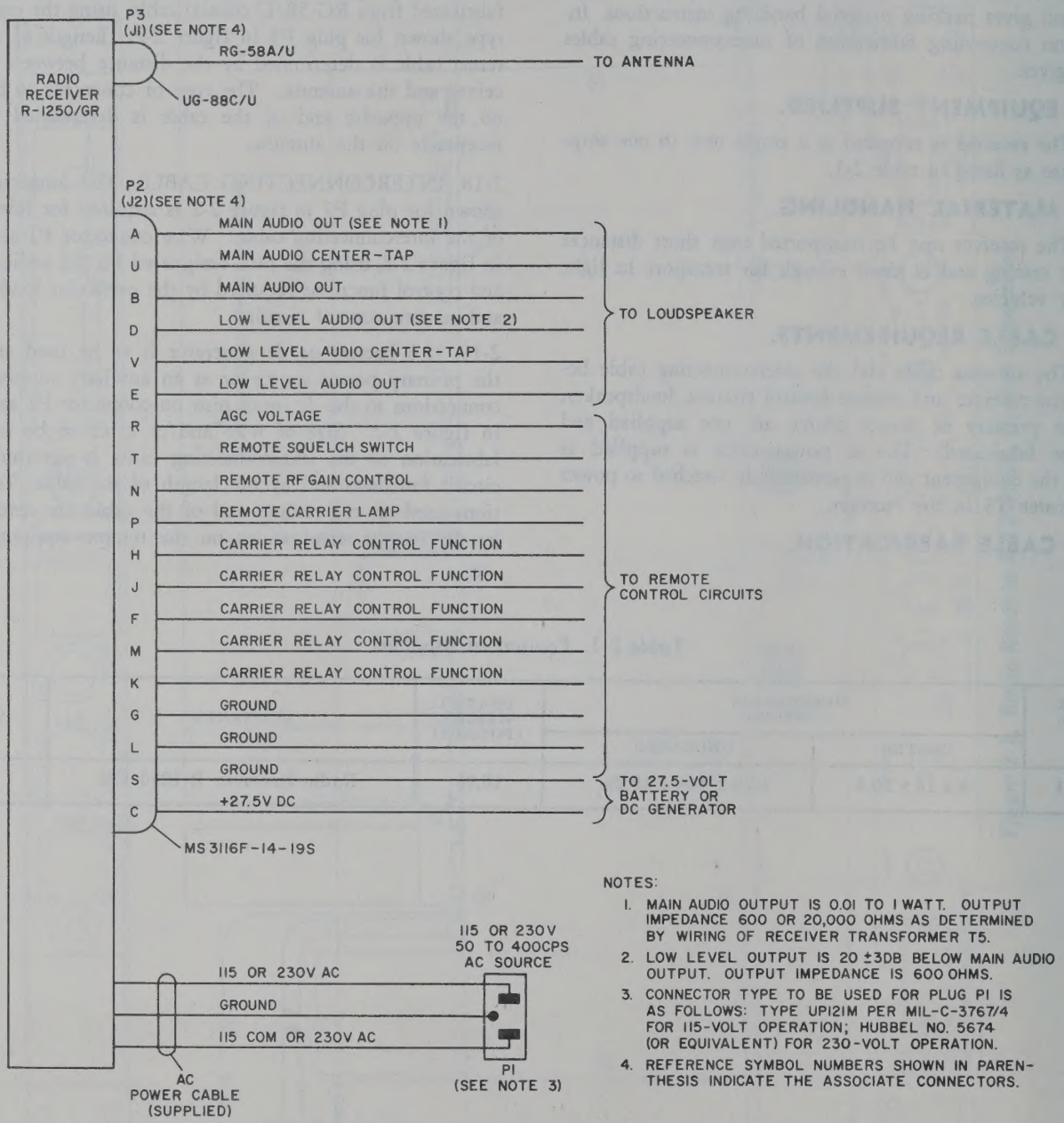



*Figure 2-2. Interconnecting Cables*

# SECTION III
# INSTALLATION PROCEDURES

2-20. INTRODUCTION. This section contains the instructions you will need to install the receiver. The interconnecting cables for the receiver should be fabricated as described in Section II before starting installation procedures.

## 2-21. GENERAL INSTALLATION INSTRUCTIONS.

2-22. CASE IDENTIFICATION. The receiver is shipped in a single case as listed in table 2-1. Report any damage of the shipping case to the responsible authority.

2-23. UNPACKING. Unpack the receiver from the shipping case just prior to installation. Save the packing list and the shipping case (together with lining and padding). Store these items for use in reshipment.

2-24. ITEM IDENTIFICATION. At the time you unpack the receiver, check the contents of the shipping case against the packing list. Report any missing or damaged items.

## 2-25. INSTALLATION OF RECEIVER.

2-26. PRIMARY AC POWER INPUT CONNECTIONS. Transformer T3 (see figure 2-3) can be wired to permit operation of the receiver from either a 115- or 230-volt ac primary power source. The receiver is shipped from the factory with the transformer wired for 115-volt ac operation. The following procedure contains the information needed to wire the transformer for either 115- or 230-volt operation:

a. Refer to figure 2-3. Remove the eight mounting screws from the equipment cover on the top of the receiver, and remove the cover.

b. If the receiver is to be operated from a 115-volt ac source, complete the following steps:

(1) Wire transformer T3 (see figure 2-4) as shown in A of figure 2-5.

(2) Obtain a 250-volt, ¼-ampere fuse (Type F02GR250A per MIL-F-15160). Refer to figure 2-4, and install the fuse in the holder for fuse F2.

(3) Obtain a 115-volt power connector (Type UP121M per MIL-C-3767/4). Install the connector for plug P1 on the ac power cable as shown in figures 2-2 and 2-3.

c. If the receiver is to be operated from a 230-volt ac source, complete the following steps:

(1) Wire transformer T3 (see figure 2-4) as shown in B of figure 2-5.

(2) Obtain a 250-volt, ⅛-ampere fuse (Type F02GR125A per MIL-F-15160). Refer to figure 2-4, and install the fuse in the holder for fuse F2.

(3) Obtain a 230-volt power connector (Hubbel No. 5674, or equivalent). Install the connector for plug P1 on the ac power cable as shown in figures 2-2 and 2-3.

d. Replace the equipment cover on the top of the receiver, and secure the cover in place with the eight screws removed in preceding step *a*.

2-27. MAIN AUDIO OUTPUT CONNECTIONS. Transformer T5 (see figure 2-3) can be wired to provide a main audio output impedance of either 600 or 20,000 ohms. The receiver is shipped from the factory with the transformer wired for an output impedance of 600 ohms. The following

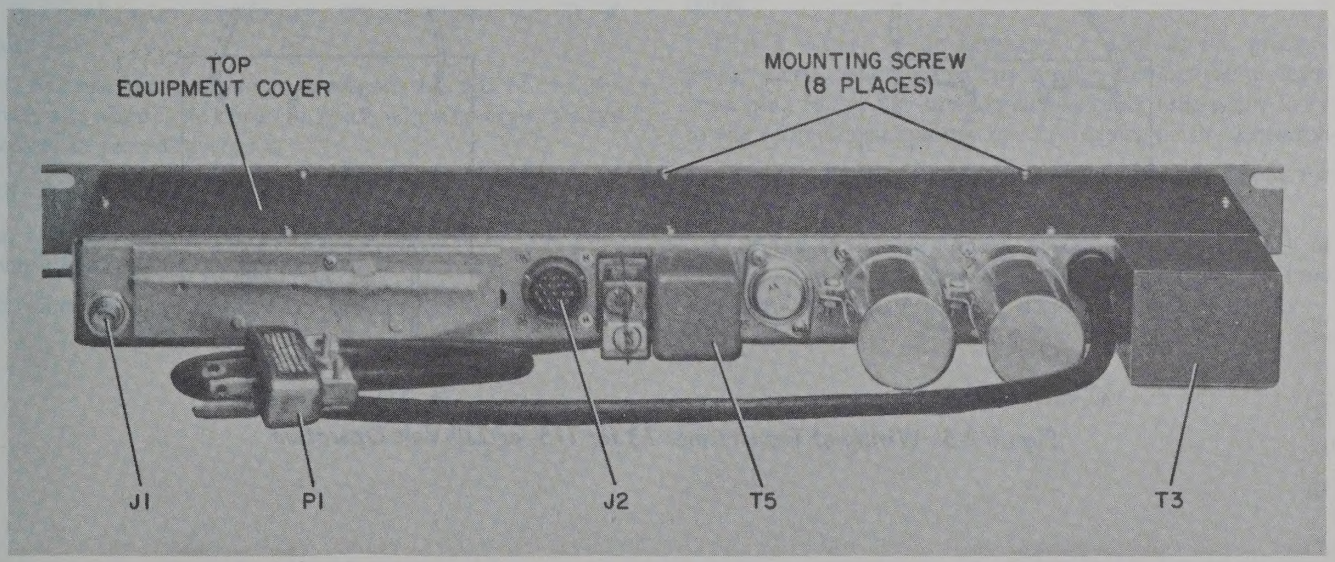



*Figure 2-3. Receiver, Rear View, Parts Locations*

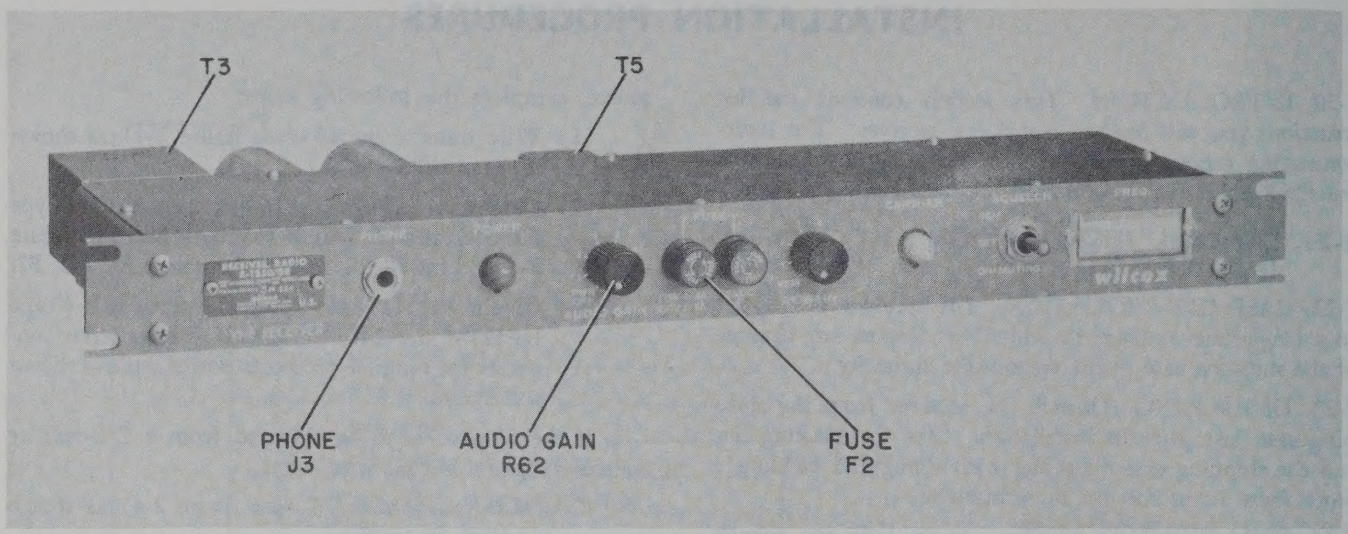



*Figure 2-4. Receiver, Front View, Parts Locations*

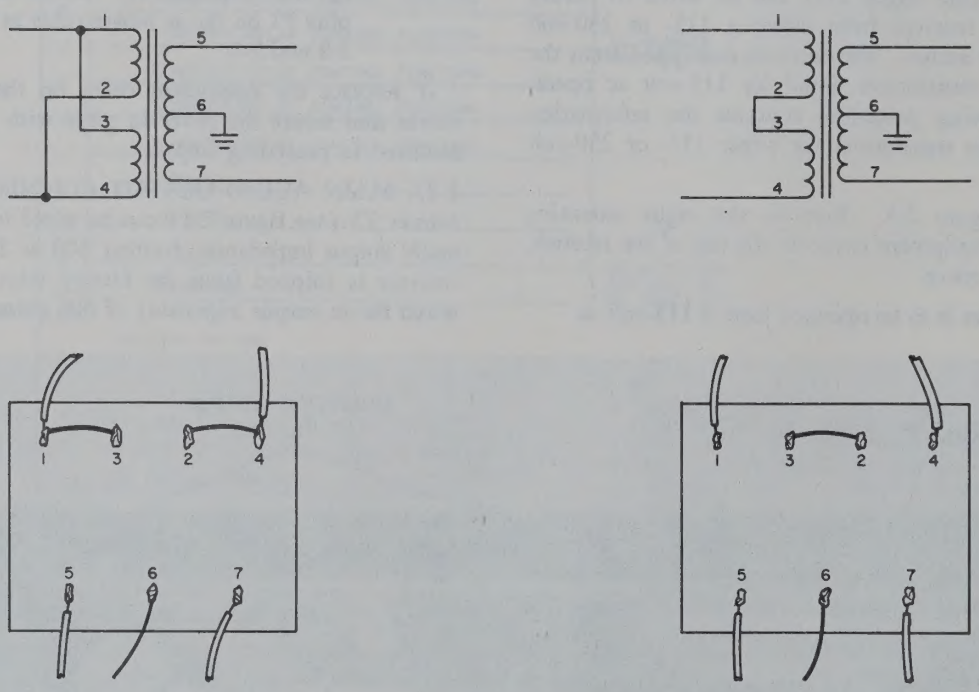
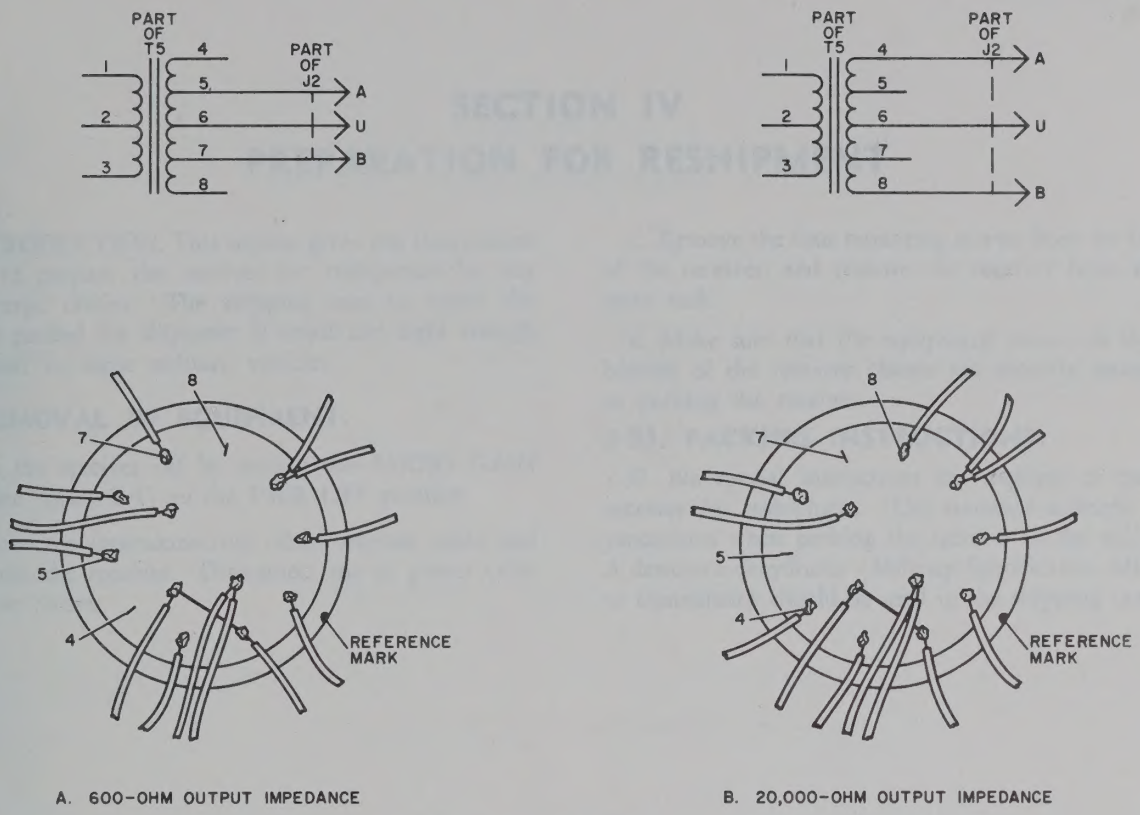



*Figure 2-5. Wiring of Transformer T3 for 115- or 230-Volt Operation*




A. 600-OHM OUTPUT IMPEDANCE

B. 20,000-OHM OUTPUT IMPEDANCE

*Figure 2-6. Wiring of Transformer T5 for Output Impedances of 600 or 20,000 Ohms*

procedure contains the information needed to wire the transformer for either output impedance:

a. Refer to figure 2-3. Remove the eight mounting screws from the equipment cover on top of the receiver, and remove the cover.

b. If a main audio output impedance of 600 ohms is to be used, wire transformer T5 (see figure 2-4) as shown in A of figure 2-6.

c. If a main audio output impedance of 20,000 ohms to be used, wire transformer T5 as shown in B of figure 2-6.

d. Replace the equipment cover on the top of the receiver, and secure the cover in place with the eight screws removed in preceding step *a*.

2-28. INSTALLATION PROCEDURES.

a. Install the receiver in the equipment rack with four mounting screws (not supplied).

b. Connect plug P3 on the antenna cable (see figure 2-2) to receptacle J1 on the rear of the receiver (see figure 2-3).

c. Connect plug P2 on the interconnecting cable (see figure 2-2) to receptacle J2 on the rear of the receiver (see figure 2-3).

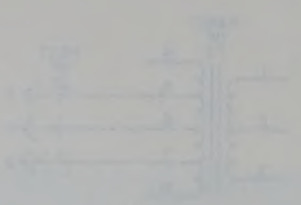
d. Turn the receiver off by setting AUDIO GAIN control R62 (see figure 2-4) to the PWR OFF position.

e. If an ac source is used for primary power, insert plug P1 on the ac power cable (see figure 2-3) into the ac outlet.

f. If a battery or dc generator is used as the primary power source or as an auxiliary supply, connect the dc leads from plug P2 on the interconnecting cable (see figure 2-2) to the output terminations on the battery or dc generator.

g. Insert the headset plug into PHONE jack J3 on the receiver front panel (see figure 2-4).

h. Refer to the alignment procedures in Section I of Chapter 5 in this manual for instructions on how to tune and align the receiver to the desired channel frequency.



# SECTION IV
# PREPARATION FOR RESHIPMENT

2-29. INTRODUCTION. This section gives you instructions necessary to prepare the receiver for reshipment by any standard cargo carrier. The shipping case in which the receiver is packed for shipment is small and light enough for transport in light military vehicles.

## 2-30. REMOVAL OF EQUIPMENT.

a. Turn the receiver off by setting the AUDIO GAIN control (see figure 2-4) to the PWR OFF position.

b. Remove the interconnecting cable, antenna cable, and headset from the receiver. Disconnect the ac power cable from the ac outlet.

c. Remove the four mounting screws from the front panel of the receiver, and remove the receiver from the equipment rack.

d. Make sure that the equipment covers on the top and bottom of the receiver chassis are securely mounted prior to packing the receiver.

## 2-31. PACKING INSTRUCTIONS.

2-32. No special instructions are required to package the receiver for reshipment. Use standard military packaging procedures when packing the receiver in the shipping case. A desiccant dehydrator (Military Specification MIL-D-9394, or equivalent) should be used in the shipping case.

# CHAPTER 3
# OPERATION

3-1. INTRODUCTION. This chapter gives the instructions you will need to operate the receiver. The chapter is divided into three sections. Section I lists and describes the controls and indicators you will use to operate the receiver. Section II gives detailed operating instructions you will need to obtain maximum performance from the equipment. Section III, Emergency Operation, is not applicable. To avoid receiver malfunction, be sure you are completely familiar with the controls, indicators, and operating procedures given in this chapter prior to energizing the receiver.

## SECTION I
## CONTROLS AND INDICATORS

### 3-2. IDENTIFICATION OF CONTROLS AND INDICATORS.

3-3. Table 3-1 lists the common name, reference designation, and the function of the controls and indicators on the receiver. Figure 3-1 shows the locations of the controls and indicators on the receiver.

*Table 3-1. Controls and Indicators*

| COMMON NAME | REFERENCE DESIGNATION | FUNCTION |
|---|---|---|
| CARRIER indicator lamp | DS2 | Lamp glows:<br>(1) When the receiver squelch circuit is disabled by setting SQUELCH switch S3 to the OFF position.<br>(2) When the receiver squelch circuit is activated by setting SQUELCH switch S3 to the ON/MUTING position and the level of the receiver carrier is above the squelch threshold.<br>(3) When SQUELCH switch S3 is set to the REM position and the remote squelch switch is set as described for preceding condition (1) or (2). |
| POWER indicator lamp | DS3 | Lamp glows whenever ac or dc power is applied to the receiver and AUDIO GAIN control R62 is turned from the PWR OFF position. |
| RF GAIN control/remote rf gain switch | R19/S1 | When SQUELCH switch S3 is set to the ON/MUTING position, control R19 adjusts threshold at which the squelch circuit opens by varying the rf gain of the receiver.<br>When SQUELCH switch S3 is set to the OFF position, control R19 adjusts the rf gain of the receiver.<br>When control R19 is set to the REM position, switch S1 transfers adjustment of the receiver rf gain to the remote rf gain control. |

*Table 3-1. Controls and Indicators (Cont)*

| COMMON NAME | REFERENCE DESIGNATION | FUNCTION |
|---|---|---|
| AUDIO GAIN control/power switch | R62/S2 | Adjusts the level of the audio signal delivered to the headset and the audio output pins on receptacle J2. Switch S2 applies primary ac or dc power to the receiver whenever control R62 is moved from the PWR OFF position. |
| SQUELCH switch | S3 | REM position:<br>Transfers control of receiver squelch circuit to the remote squelch switch.<br>OFF position:<br>Disables receiver squelch circuit.<br>ON/MUTING position:<br>Activates receiver squelch and muting circuits. |

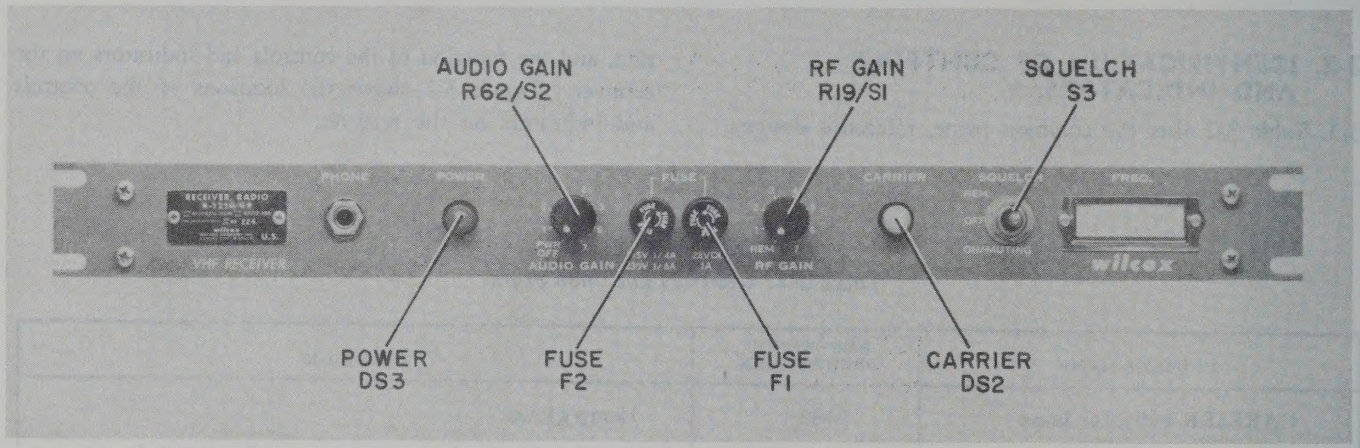



*Figure 3-1. Receiver, Front Panel Control and Indicator Locations*

# SECTION II
# OPERATING INSTRUCTIONS

3-4. INTRODUCTION. This section contains the instructions you will need to start, operate, and stop the receiver. In the operating procedures described in this section, the radio set is assumed to be completely installed and connected to the primary power source, antenna, headset, and remote control equipment and loudspeaker.

## 3-5. GENERAL OPERATING INSTRUCTIONS.

3-6. The following paragraphs are applicable to both local and remote operation, except where noted. Prior to remote operation, the procedures for setting controls on the receiver front panel must be performed by the remote operator, or assistant.

## 3-7. STARTING.

3-8. Refer to figure 3-1, and turn the AUDIO GAIN control in a clockwise direction from the PWR OFF position. The POWER indicator lamp shall glow.

## 3-9. LOCAL OPERATION.

a. Refer to figure 3-1. Set the RF GAIN control to the full clockwise position and the AUDIO GAIN control to position 4.

b. Set the SQUELCH switch to the OFF position. Receiver background noise shall be heard in the headset, and the CARRIER indicator lamp shall glow.

c. Set the SQUELCH switch to the ON/MUTING position. If the CARRIER indicator lamp is extinguished, leave the RF GAIN control set to the full clockwise position. If the receiver is located in a noise environment sufficient to break the receiver squelch and cause the lamp to glow, adjust the RF GAIN control in a counterclockwise direction until the lamp is *just* extinguished.

d. When an amplitude-modulated signal is received, adjust the AUDIO GAIN control until the audio signals heard in the headset are at the desired listening level.

e. If desired, the receiver may be operated with the squelch circuit disabled by setting the SQUELCH switch to the OFF position.

## 3-10. REMOTE OPERATION.

a. Refer to figure 3-1. Set the AUDIO GAIN control to position 4 and the RF GAIN control to the REM position.

b. Place the SQUELCH switch in the REM position.

## 3-11. STOPPING.

3-12. Set the AUDIO GAIN control to the PWR OFF position. The POWER indicator lamp should be extinguished.

# SECTION III
# EMERGENCY OPERATION

NOT APPLICABLE

# CHAPTER 4
# PRINCIPLES OF OPERATION

4-1. INTRODUCTION. This chapter contains information that will aid you in understanding how the receiver operates. The chapter is divided into three sections. Section I describes the principles of receiver operation. Section II describes the functional operation of the individual electronic circuits. Section III, Functional Operation of Mechanical Assemblies, is not applicable.

## SECTION I
## FUNCTIONAL SYSTEM OPERATION

### 4-2. GENERAL.

4-3. Radio Receiver R-1250/GR is a ground-based vhf unit capable of receiving amplitude-modulated radiotelephone signals on a preset channel in the frequency range from 116.00 to 149.95 megacycles. Basically, the receiver consists of single-conversion superheterodyne circuitry plus certain auxiliary circuits. An antenna, primary power source, remote control equipment, and loudspeaker or headset are required to complete the receiver system. Remote control and loudspeaker requirements are compatible with FSA-22 and FAA4 remote control equipment.

### 4-4. BLOCK DIAGRAM ANALYSIS.

4-5. GENERAL. A functional block diagram of the receiver is shown in figure 6-1. Refer to figure 6-1 as you read the block diagram discussion given in the following paragraphs.

4-6. SIGNAL CIRCUITS. Rf signals in the 116.00- to 149.95-mc range are received by the antenna and then amplified by first and second rf amplifiers Q1 and Q2. Transistors Q12 and Q13 function as a two-stage local oscillator that operates on a single crystal-controlled frequency below the received rf signal. Output of the local oscillator is injected into mixer Q3, where it is combined with the output of second rf amplifier Q2 to produce the receiver intermediate frequency of 17 mc. This i-f signal is amplified by a four-stage amplifier consisting of transistors Q4 through Q7 and then applied to audio and agc detector Q8.

4-7. When SQUELCH switch S3 is set to the ON/MUTING position, audio signals from detector Q8 pass through diode CR6 to first audio amplifier Q16 *only* if the received rf carrier level exceeds the squelch threshold. Otherwise, the audio signals are applied to Q16 through the muting control circuit. When SQUELCH switch S3 is set to the OFF position, the audio signals pass through diode CR6 to Q16. Audio signals at the input of Q16 are amplified by transistors Q16 and Q17 and the push-pull output amplifier consisting of transistors Q18 and Q19.

4-8. AUXILIARY CIRCUITS. The dc component of the detected i-f signal is amplified by first and second agc amplifiers Q9 and Q10. Dc output voltage from Q10 is applied as a forward automatic-gain-control (agc) voltage to first and second rf amplifiers Q1 and Q2 and mixer Q3. The agc voltage is also applied to squelch amplifier Q11 and to the input of the rf gain control circuit.

4-9. The rf gain control circuit provides a means of controlling the gain of first i-f amplifier Q4 and, thereby, the over-all gain of the receiver. When SQUELCH switch S3 is set to the ON/MUTING position, the gain control circuit and the local (or remote) rf gain control establish the squelch threshold of the receiver by acting as an adjustable shunt attenuator for the output signal of transistor Q4. When remote rf gain switch S1 is set to the REM (remote) position, adjustment of receiver rf gain is transferred to the remote rf gain control.

4-10. Squelch amplifier Q11 is operated as a switch to control the action of squelch-gate and noise-limiter diode CR6 and carrier-operated relay K1. When SQUELCH switch S3 is set to the ON/MUTING position, transistor Q11 is switched 'on' *only* if the received rf carrier level exceeds the squelch threshold. Otherwise, Q11 is switched 'off'. Transistor Q11 is always switched 'on' when SQUELCH switch S3 is set to the OFF position. When transistor Q11 is switched 'on', diode CR6 is forward biased and relay K1 is energized. Otherwise, CR6 is reverse biased and K1 de-energized. When SQUELCH switch S3 is set to the REM (remote) position, manual control of the state of squelch amplifier Q11 is transferred to the remote squelch switch.

4-11. When the receiver is operated from a 115- or 230-volt, 50- to 400-cps power source, the ac voltage is applied

to the power rectifier circuit. The nominal +33-volt unregulated output of the rectifier circuit is supplied to series voltage regulator Q14, regulator amplifier Q15, the battery charger and reverse-polarity protection circuit, the coil of carrier-operated relay K1, and the indicator lamp circuits. The nominal +28-volt ouput of the battery charger is intended for use in trickle charging an external battery. When the receiver is operated from a +27.5-volt source, the dc voltage is applied through the reverse-polarity protection circuit to the regulator, relay, and indicator circuits.

4-12. Transistors Q14 and Q15 are employed in a voltage regulator circuit that provides a +20-volt regulated output for use in various stages of the receiver.

# SECTION II
# FUNCTIONAL OPERATION OF ELECTRONIC CIRCUITS

## 4-13. GENERAL.

4-14. For complete circuit details of the receiver, refer to the over-all schematic diagram in figure 6-2. Refer to T.O. 31-1-141 for basic theory of common circuits.

## 4-15. CIRCUIT ANALYSIS.

4-16. FIRST RF AMPLIFIER.

4-17. Rf signals received by the antenna in the range of 116.00 to 149.95 mc are fed through a double-tuned circuit and coupled by capacitor C6 to the base of first rf amplifier Q1, which functions as a low-noise common-emitter amplifier. Gain of Q1 is controlled by means of agc voltage derived from second agc amplifier Q10. Resistor R2, in the collector circuit of Q1, provides additional forward agc control. Capacitor C7 bypasses resistor R2 over the signal frequency range. The signal coupled through capacitor C7 is applied to the base of second rf amplifier Q2 through a single-tuned circuit and capacitor C9.

4-18. SECOND RF AMPLIFIER.

4-19. Second rf amplifier Q2 is a conventional common-emitter stage. The second rf amplifier is also controlled by agc voltage derived from second agc amplifier Q10. Resistor R6, in the collector circuit of Q2, provides additional forward agc control. In order to maintain good rf linearity, resistor R6 is not bypassed. The amplified signal fed through resistor R6 from the collector of Q2 is applied to the base of mixer Q3 through a single-tuned circuit and capacitor C62. Use of a single-tuned circuit in the outputs of the first and second rf amplifier stages, preceded by a double-tuned circuit at the input of the first rf amplifier stage, establishes an over-all front-end bandpass that provides the required suppression of cross-modulating signals, especially at the 0.5-megacycle points.

4-20. LOCAL OSCILLATOR.

4-21. Transistors Q12 and Q13 function in a modified Butler circuit as the local oscillator. The oscillator operates 17 mc below the rf carrier signal on a single crystal-controlled frequency in the range of 99.00 to 132.95 mc. Crystal Y1, a modified Type CR-56A/U low-temperature-coefficient unit, is operated at series resonance on its fifth overtone mode. Coil L11 is connected across crystal Y1 to cancel a portion of the shunt capacitance of the crystal. Coil L10 and variable capacitor C46 form the principal elements of the oscillator tank circuit. Capacitors C47 and C49 provide temperature compensation for the collector-to-base junction of transistor Q12. Oscillator output is extracted from a voltage divider formed by resistors R74 and R76 in the collector circuit of transistor Q13. The voltage divider maintains the proper load on the oscillator circuit and establishes the proper injection level for mixer Q3. The injection voltage is coupled to the emitter of mixer Q3 through capacitor C22.

4-22. MIXER.

4-23. Mixer Q3 combines the rf and injection signals to develop a difference component of 17.00 mc as the intermediate frequency (i-f) of the receiver. Coil L7 and capacitor C21 form a series-tuned circuit at 17 mc to provide a low impedance path for the i-f signal from the emitter of Q3 to ground. Mixer gain is controlled by agc voltage which is supplied to the base of transistor Q3 through a filter and decoupling network. Resistor R79 in the collector circuit of Q3 provides additional forward agc control. Capacitor C63 bypasses resistor R79 at the 17-mc i-f frequency. The i-f signal coupled through capacitor C63 is applied to the input of 17-mc crystal filter FL1 through a tuned output circuit. Capacitors C19 and C20 in the tuned circuit are arranged as a capacitive divider to present the proper driving impedance for filter FL1. Response of the filter is $\pm 15$ kc minimum at 6 db, and $\pm 31$ kc maximum at 60 db. Output of filter FL1 is applied to the input of the four-stage i-f amplifier.

4-24. I-F AMPLIFIER.

4-25. FIRST I-F AMPLIFIER. The first i-f amplifier and rf gain control circuit is shown in figure 4-1. The i-f input signal from filter FL1 is coupled through tunable transformer T1 and applied to the base of first i-f amplifier Q4. Transformer T1 matches the output impedance of filter FL1 to the input impedance of transistor Q4. First i-f amplifier Q4 is arranged as an emitter-follower. Gain of the first i-f amplifier is controlled by the rf gain control circuit. Attenuation provided by the rf gain control circuit is determined by the position of the local or remote rf gain control and the developed agc voltage.

4-26. Resistors R15 and R16 form a voltage divider that applies approximately $+15$ volts to the anode of diode CR2 in the absence of a signal and with RF GAIN control R19 set to the full clockwise position. Under these conditions, the voltage divider formed by control R19 and resistor R24 applies approximately $+16$ volts to the cathode of diode CR3, causing both diodes CR2 and CR3 to be reverse biased. When remote rf gain switch S1 is placed in the REM (remote) position, the remote rf gain control is substituted for control R19. With diodes CR2 and CR3 reverse biased, the only load on first i-f amplifier Q4 is the input impedance of second i-f amplifier Q5, and the receiver is operated at maximum gain.

4-27. When RF GAIN control R19 is set to the full counterclockwise position, the voltage at the cathode of diode CR3 drops to zero, causing the anode potential on diode CR2 to follow. In this condition, diodes CR2 and CR3 are in maximum conduction. The potential on the cathode of diode CR3 is varied between 0 and approximately $+16$

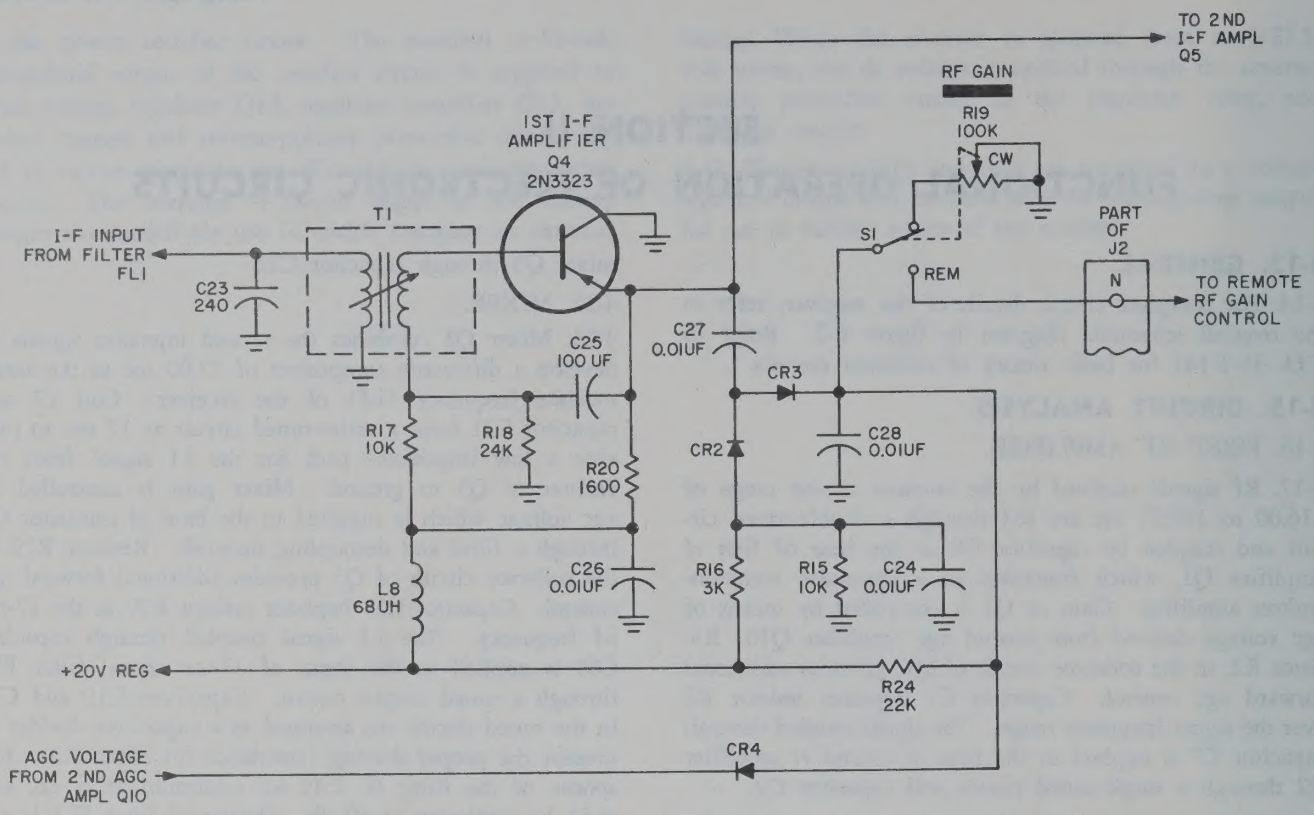



*Figure 4-1. First I-f Amplifier and Rf Gain Control Circuit, Partial Schematic Diagram*

volts for intermediate positions of control R19. With diodes CR2 and CR3 in conduction, the load on first i-f amplifier Q4 increases due to the lower impedance path that is formed from the emitter of Q4 to ground through capacitor C27, diodes CR2 and CR3, and capacitors C24 and C28. As the load on first i-f amplifier Q4 is increased, the gain of the receiver is reduced.

4-28. With a 3-microvolt or greater input signal and RF GAIN control R19 set to the full clockwise position, the receiver agc voltage decreases from the no-signal level of +20 volts to approximately +15 volts, causing diode CR4 to conduct. With CR4 in conduction, diodes CR2 and CR3 begin to conduct. With larger rf signal levels, the agc voltage continues to decrease, causing the conduction of diodes CR2 and CR3 to increase. Decreasing the receiver agc voltage then acts in the same manner to reduce the gain of the receiver as turning the RF GAIN control in a counterclockwise direction. When the potential on the cathode of CR3 drops below +4 volts, the agc circuits are saturated. Any further increases in rf signal level have no effect on receiver sensitivity or gain.

4-29. SECOND I-F AMPLIFIER. Second i-f amplifier Q5, driven directly from the output of first i-f amplifier Q4, is arranged in an emitter-follower configuration. Output of Q5 is applied directly to the base of third i-f amplifier Q6.

4-30. THIRD I-F AMPLIFIER. Third i-f amplifier Q6 functions as a conventional common-emitter amplifier. The output load for Q6 is the input impedance of fourth i-f amplifier Q7.

4-31. FOURTH I-F AMPLIFIER. Transistor Q7 functions in a common-emitter configuration as the fourth (final) i-f amplifier stage. The amplified i-f output signal appearing at the collector is coupled through tunable transformer T2 to the base of audio and agc detector Q8. Transformer T2, resonated at 17 mc, aids in suppressing signals differing from the receiver i-f while matching the output impedance of Q7 to the input impedance of transistor Q8.

4-32. AUDIO AND AGC DETECTOR.

4-33. Transistor Q8 functions as the audio and agc detector. Detected audio signals appearing on the emitter of Q8 are fed through a low-pass filter network consisting of resistors R29 and R80 and capacitors C57 and C35. This low-pass filter network establishes the audio response of the receiver. Audio signals appearing at the output of the filter network are coupled by capacitor C36 to squelch-gate and noise-limiter diode CR6. The audio signals are also applied to the input of the muting control circuit, which consists of resistor R30, muting control R36, and capacitor C39. The dc component of the detected i-f signal appearing on the collector of transistor Q8 is filtered by capacitor C34 and resistor R28 and fed through resistor R31 to the base of first agc amplifier Q9.

4-34. SQUELCH GATE AND MUTING CIRCUITS.

4-35. The squelch gate and muting circuits are shown in figure 4-2. Diode CR6 serves as the squelch gate and also functions as a series noise limiter of the current-limiting type. Detected audio signals from the emitter of Q8 are applied to the anode of CR6. The squelch gate is opened when-

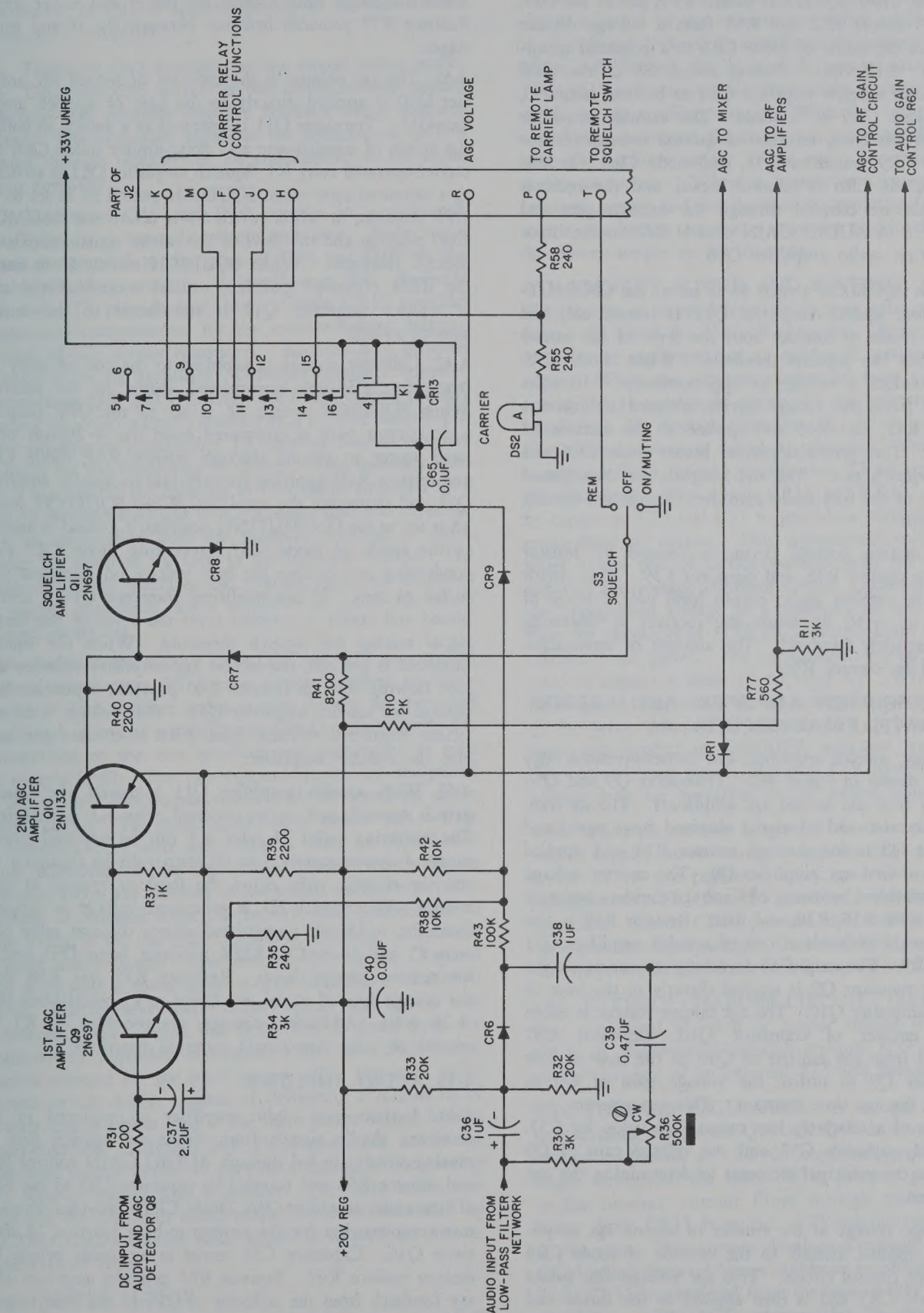



*Figure 4-2. Squelch, Muting, Agc, and Carrier-Operated Relay Circuits, Partial Schematic Diagram*

ever the level of the carrier signal exceeds the squelch threshold, or when SQUELCH switch S3 is set to the OFF position. Resistors R32 and R33 form a voltage divider which places the anode of diode CR6 at a potential of approximately +10 volts. Placing switch S3 in the OFF position causes squelch amplifier Q11 to become saturated, allowing diode CR9 to conduct. The cathode of diode CR6 is then effectively returned to ground through resistor R43, diode CR9, transistor Q11, and diode CR8. In this condition, diode CR6 is forward biased, and the receiver audio signals are coupled through the squelch gate and capacitor C38 to AUDIO GAIN control R62 in the input circuit of first audio amplifier Q16.

4-36. When SQUELCH switch S3 is set to the ON/MUTING position, squelch amplifier Q11 is turned off, and diode CR9 ceases to conduct until the level of the carrier signal reaches the squelch threshold. When diode CR9 ceases to conduct, a voltage of approximately +10 volts is obtained from the voltage divider formed by resistors R35, R38, R42, and R43 and applied to the cathode of diode CR6. This potential reverse biases diode CR6 and closes the squelch gate. The audio signals are then passed to the input of the first audio amplifier through the muting control circuit.

4-37. The muting control circuit is formed by resistor R30, muting control R36, and capacitor C39. This circuit attenuates the receiver audio output level over a range of from —6 to —30 db when the receiver is operating below the squelch threshold. The amount of attenuation is governed by control R36.

4-38. AGC, SQUELCH AMPLIFIER, AND CARRIER-OPERATED RELAY CIRCUITS.

4-39. The agc, squelch amplifier, and carrier-operated relay circuits are shown in figure 4-2. Transistors Q9 and Q10 serve as the first and second agc amplifiers. The dc component of the detected i-f signal obtained from audio and agc detector Q8 is fed through resistor R31 and applied to the base of first agc amplifier Q9. The emitter voltage on Q9 is established by means of a voltage divider consisting of resistors R34, R35, R38, and R42. Resistor R38 is also connected in the collector circuit of squelch amplifier Q11 via diode CR9. The amplified dc voltage appearing on the collector of transistor Q9 is applied directly to the base of second agc amplifier Q10. The agc output voltage is taken from the emitter of transistor Q10. Capacitor C37 is connected from the emitter of Q10 to the base of first agc amplifier Q9 to utilize the voltage gain of Q9 in establishing the agc time constant. This arrangement permits the use of a relatively low capacitance value for C37. Resistor R31, capacitor C37, and the voltage gain of Q9 then become the principal elements in determining the agc time constant.

4-40. The agc voltage at the emitter of second agc amplifier Q10 is applied directly to the cathode of diode CR4 in the rf gain control circuit. This agc voltage also passes through diode CR1 and is then applied to the mixer and rf amplifier stages. Diode CR1 delays agc action in the rf and mixer stages until the i-f agc range is complete. Resistors R10 and R11 form a voltage divider which establishes the proper base voltage for the rf and mixer stages. Resistor R77 provides isolation between the rf and mixer stages.

4-41. The agc voltage at the collector of second agc amplifier Q10 is applied directly to the base of squelch amplifier Q11. Transistor Q11 is operated as a switch to control the action of squelch-gate and noise-limiter diode CR6 and carrier-operated relay K1. Squelch amplifier Q11 is switched to a saturated state when SQUELCH switch S3 is set to the OFF position, or when switch S3 is set to the ON/MUTING position and the level of the carrier signal exceeds the squelch threshold. When SQUELCH switch S3 is set to the REM (remote) position, manual control of the state of squelch amplifier Q11 is transferred to the remote squelch switch.

4-42. Collector voltage is supplied to the coil of relay K1 from the +33-volt unregulated source in the receiver. When SQUELCH switch S3 is set to the OFF position, a dc current path is completed from the +20-volt regulated source to ground through resistor R41, diode CR7, and resistor R40, applying forward bias to squelch amplifier Q11 and saturating the amplifier. When SQUELCH switch S3 is set to the ON/MUTING position, a ground is applied to the anode of diode CR7, preventing diode CR7 from conducting and causing the base voltage on transistor Q11 to fall to zero. In this condition, transistor Q11 is reverse biased and ceases to conduct until the level of the carrier signal reaches the squelch threshold. When the squelch threshold is reached, the second agc amplifier collector current flowing through resistor R40 provides a positive base voltage for squelch amplifier Q11. This voltage is of sufficient magnitude to cause diode CR8 to conduct and saturate the squelch amplifier.

4-43. With squelch amplifier Q11 saturated, the squelch gate is opened, and carrier-operated relay K1 is energized. The operating point of relay K1 can be adjusted over a range of approximately 3 to 60 microvolts by changing the receiver rf gain with either the local or remote rf gain control. When relay K1 is energized, voltage is supplied from the +33-volt unregulated source through relay contacts 15 and 16 to CARRIER indicator lamp DS2 and to the remote 'carrier' lamp. Resistors R55 and R58 drop the voltage applied to the two lamps to a potential less than +28 volts. Additional contacts are provided on K1 for control of other (optional) external functions.

4-44. AUDIO AMPLIFIER.

4-45. A three-stage audio amplifier is employed in the receiver. Audio signals from either the squelch gate or muting circuit are fed through AUDIO GAIN control R62 and resistor R63 and coupled by capacitor C53 to the base of first audio amplifier Q16. Diode CR16 provides temperature compensation for the emitter-to-base junction of transistor Q16. Capacitor C55 serves as an audio bypass for emitter resistor R67. Resistor R65 provides negative voltage feedback from the collector of Q16 to the base to provide both ac and dc stability. Over-all negative feedback from the output of the three-stage amplifier is applied to

the collector of Q16 through resistor R68. The signal at the collector of Q16 is applied directly to the base of the second audio amplifier.

4-46. Transistor Q17 functions as the second audio amplifier. Capacitor C56 serves as the audio emitter bypass. Capacitor C64 provides negative feedback from collector to base. The amplified signal at the collector of Q17 is coupled through transformer T4 and applied to the audio output amplifier.

4-47. Transistors Q18 and Q19 operate in a push-pull, Class B circuit as the audio output amplifier. Audio input signals are coupled to the bases of Q18 and Q19 via the tapped secondary winding of transformer T4. Resistors R71 and R72 provide base bias. Diode CR17 provides temperature compensation for the emitter-to-base junction of each of the output transistors. Resistor R73 provides dc stability for the amplifier. Collector voltage is supplied to transistors Q18 and Q19 from the center-tapped primary winding of audio output transformer T5. The second primary winding of transformer T5 supplies over-all negative feedback for the three-stage amplifier. This feedback voltage is supplied to the collector of first audio amplifier Q16 through resistors R69 and R68. Resistor R66 and capacitor C54, in conjunction with the feedback winding of transformer T5, establish the level of the feedback voltage. The feedback voltage stabilizes the over-all gain and decreases the output impedance of the amplifier to reduce the effect of load variations.

4-48. Audio output signals from Q18 and Q19 are coupled through transformer T5 to the remote headset or loudspeaker. Two receiver audio output circuits are provided by the two secondary windings contained on transformer T5. Connections to the two windings are terminated at pins on receptacle J2. The two output circuits are designated as the main audio output circuit and the low-level audio output circuit. The main audio output circuit will deliver a minimum of 1 watt into either a 600- or 20,000-ohm load, depending on the connections made to the taps on the main secondary winding of the output transformer. The receiver is shipped from the factory with connections to taps 5 and 7 on the main secondary winding, to provide a main audio output impedance of 600 ohms. Taps 4 and 8 provide a main audio output impedance of 20,000 ohms. The low-level audio output circuit will deliver into a 600-ohm load a signal that is 20 $\pm 3$ db down from the main output, regardless of whether a 600- or a 20,000-ohm load is selected for the main output. The low-level audio output circuit is also capable of delivering a minimum of 1 watt into a 6-ohm load if the main audio output load is open-circuited. PHONE jack J3 is connected across the low-level output circuit to provide a means of monitoring the receiver output with a headset. The main audio output and the low-level audio output are both controlled by AUDIO GAIN control R62, which is located on the receiver front panel.

4-49. POWER SUPPLY.

4-50. The receiver is normally operated from a 115-volt, 50- to 400-cps, ac source, but facilities are provided for operation from a 230-volt, 50- to 400-cps, ac source or a 27.5-volt battery or dc generator. A battery charging circuit is included in the receiver to permit trickle charging of an external 27.5-volt battery from the primary ac power source. If desired, the ac and dc power sources can be connected to the receiver simultaneously, with the dc source serving as an auxiliary supply. With the equipment connected in this manner, the receiver is automatically powered from the auxiliary supply in the event of an interruption of the ac power. When a battery is connected as the auxiliary supply and the receiver is operating from the ac source, the battery receives a constant trickle charge from the power supply in the receiver.

4-51. PRIMARY POWER AND RECTIFIER CIRCUITS. The receiver is shipped from the factory with power transformer T3 wired for 115-volt operation. Power switch S2 controls the application of ac and/or dc power to the receiver. When the receiver is operated from an ac power source, the ac voltage is applied to the primary of power transformer T3 through connector P1 and switch S2. Fuse F2 provides protection during ac operation. The ac voltage is stepped down through transformer T3 to approximately 80 volts, rectified by diodes CR11 and CR12, and filtered by capacitors C50 and C51 to provide a nominal $+33$-volt unregulated dc output. This unregulated voltage is supplied to the coil of carrier-operated relay K1 and to the input of the voltage regulator circuit. Resistor R56 drops the unregulated voltage to a potential of less than $+28$ volts for operation of POWER indicator lamp DS3 on the receiver front panel. The unregulated voltage is also applied to contact number 16 on relay K1. When relay K1 is energized, the voltage is fed through contacts 16 and 15 of the relay, dropped by resistor R55 to less than $+28$ volts, and applied to CARRIER indicator lamp DS2 on the receiver front panel. Resistor R58 provides a similar voltage drop for operation of the remote squelch lamp.

4-52. When the receiver is operated from an external 27.5-volt dc supply, the dc voltage is applied from pin C of connector J2 to the regulator, relay, and indicator circuits through switch S2. Fuse F1 provides protection during dc operation. Diode CR10 protects the receiver against reverse-polarity input voltage. Resistor R59 provides surge-current protection for fuse F1 and capacitors C50 and C51.

4-53. BATTERY CHARGER CIRCUIT. During ac operation, a nominal 27.5-volt dc output voltage is supplied to pin C of connector J2 through resistors R59 and R57 for trickle charging of an external 27.5-volt battery.

4-54. VOLTAGE REGULATOR. A voltage regulator circuit utilizing transistors Q14 and Q15 is employed in the receiver to provide a $+20$-volt regulated output for various stages throughout the unit. With primary power applied to the receiver, current flows through resistor R61 and Zener diode CR15 from the $+33$-volt unregulated supply in the unit. This current develops a voltage across diode CR15 which forward biases regulator amplifier Q15. Zener diode CR15 is connected from the base of Q15 to ground to establish a $+20$-volt dc reference for the regulator circuit. The collector current of transistor Q15 is used to base-bias

series regulator Q14. The collector of transistor Q14 is also connected to the receiver load. The base current of transistor Q15 is determined by the difference between the Zener reference and the regulated output voltage. The base current of Q15, in turn, determines the base and collector current of series regulator Q14. When the regulated output voltage at the collector of Q14 tends to decrease due to load changes, the base current of Q15 increases, maintaining the regulated voltage essentially constant. The regulator circuit is insensitive to changes in input voltage as long as this voltage remains greater than the reference voltage established by diode CR15. These input voltage changes only alter the collector voltages of transistors Q15 and Q14 and do not affect the base currents of the two transistors. Diode CR14 provides a base-to-emitter voltage drop for transistor Q14 to insure that transistor Q14 does not over-conduct during light load conditions.

# SECTION III
# FUNCTIONAL OPERATION OF MECHANICAL ASSEMBLIES

NOT APPLICABLE

# CHAPTER 5
# MAINTENANCE

5-1. INTRODUCTION. This chapter contains the information you will need to maintain the receiver in proper working order. These instructions are based on the premise that you understand the theory of operation and purpose of the receiver and that you have sufficient experience to perform standard maintenance procedures with the test equipment listed in this chapter. Section I of this chapter gives you instructions for organizational/field maintenance procedures. Complete performance test data is given in Section I to insure that the receiver is operating within acceptable standards. The instructions for Section II are the same as those for Section I.

## SECTION I
## ORGANIZATIONAL/FIELD MAINTENANCE

### 5-2. SCOPE.

5-3. This section of the technical manual provides instructions for test and alignment of the receiver with the test equipment listed in table 5-1. In performance of the organizational/field maintenance procedures, you will find it necessary to refer to the schematic diagram in figure 6-2.

### 5-4. TEST EQUIPMENT REQUIRED.

5-5. Table 5-1 lists the test equipment that is not supplied as part of the receiver but which you will need to perform the organizational/field maintenance instructions in this section.

### 5-6. PREVENTIVE MAINTENANCE.

5-7. Preventive maintenance procedures for the receiver include the use of basic standards of good practice and workmanship, visual inspection, and cleanliness; preventive maintenance is the best procedure for keeping the receiver up to maximum performance. Reference to and completion of the preventive maintenance workcards, T.O. 31R2-2GR-1036WC-1, is essential to avoid unnecessary equipment failures. Maintenance of appropriate records, as assigned by the command authority, is important as you may find in reviewing these records that the trouble you are encountering is indicated by previous maintenance.

### 5-8. MAINTENANCE PRACTICES.

5-9. The prime responsibility for the service record of the receiver is assigned to organizational/field maintenance personnel. Your ability to keep the receiver in proper working order is dependent on how well you evaluate information obtained from all reports and tests. Keep an accurate log of all maintenance and include pertinent meter readings taken under normal operating conditions. This information will help localize trouble quickly during testing procedures.

### 5-10. TEST POINTS.

5-11. Table 5-2 lists the test points used in the test and alignment procedures of this section. The test points are listed in numerical order and are identified both by location and circuit function. Physical locations of the test points are shown in figures 5-3, 5-4, 5-5, 5-7, and 5-9. Electrical locations of the test points are shown on the schematic diagram in figure 6-2.

### 5-12. MINIMUM PERFORMANCE STANDARDS.

5-13. Use the following test procedures to determine if the receiver meets minimum performance standards. To assure maximum performance of the receiver, the tests should be performed at regular intervals, as specified by the using command, and also after completing test, alignment, and/or repair procedures on a malfunctioning equipment. The tests, when used with the block and schematic diagrams in Chapter 6, also serve to localize trouble in a malfunctioning equipment to a particular section or circuit.

5-14. Perform the following test procedures in sequence for a complete performance check of the receiver. When testing a particular circuit for minimum performance standards, perform the preparatory procedures in paragraph 5-15, the paragraph pertaining to the circuit under test, and the final procedure in paragraph 5-22.

5-15. PREPARATORY PROCEDURES. Complete the following steps to prepare the receiver for minimum performance tests:

a. Refer to figure 3-1, and make the following switch and control settings on the front panel of the receiver.

(1) AUDIO GAIN control to the PWR OFF position.

(2) RF GAIN control to the full clockwise position.

(3) SQUELCH switch to the ON/MUTING position.

b. Connect the primary power source to the receiver. If an ac source is to be used for primary power, insert plug P1 on the receiver ac power cable into the ac outlet. Refer to Chapter 2, Section III, of this manual for information pertaining to 115- or 230-volt operation. If a 27.5-volt

*Table 5-1. Test Equipment Required*

| STOCK NUMBER | EQUIPMENT NOMENCLATURE | COMMON NAME | MANUFACTURER | REQUIRED CHARACTERISTICS |
|---|---|---|---|---|
| 5965-280-3629 | Headset, Type NT-49985-A | Headset | | Impedance: 600 ohms. |
| 5905-395-9857 | Attenuator, Fixed, UG-529U | 6-db Attenuator | | Impedance: 52 ohms.<br>Attenuation: 6 db. |
| 6625-893-0660 | Meter, Frequency, Type AN/USM-26( ) | Frequency Counter | | Freq Range: 10 cps to 10 mc.<br>Input Voltage: 1 volt rms min.<br>Input Impedance: 1 megohm shunted by 40 uuf. |
| | Converter, Frequency, Model 525B (used with AN/USM-26( ) Frequency Meter) | Frequency Converter | Hewlett-Packard Co., Palo Alto, California | Freq Range: 100 mc to 220 mc.<br>Input Voltage: 0.1 volt rms min. |
| 6625-544-8691 | Multimeter, Type ME-26( )/U | Vtvm | | Dc Voltage Ranges: 0-1, 3, 10, 30, 100, 300, and 1000 at 100 megohms.<br>Ac Voltage Ranges (rms): 0-1, 3, 10, 30, 100, and 300 at 10 megohms or less, shunted by 1.3 uuf.<br>Resistance Ranges: 0.2-500, 5K, 50K, 500K, 5 meg, 50 meg, and 500 meg.<br>Freq Response: Flat within ±1 db to 700 mc. |
| 6625-539-9685 | Generator, Signal, Type AN/USM-44 | Signal Generator | | Freq Range: 10 to 480 mc.<br>Output Voltage: 0.1 microvolt to 500 millivolts.<br>Impedance: 50 ohms.<br>Modulation: Internal 400- and 1000-cps sine wave or by externally applied signal. |
| 6625-714-8992 | Oscilloscope, Type 545A | Oscilloscope | Tektronix Inc, Beaverton, Oregon | Sensitivity: 0.05 volt/cm max.<br>Freq Range: Dc to 30 mc. Down 3 ±0.5 db at 30 mc.<br>Input Impedance: 10 megohms, 11.5 uuf (with P6000 probe).<br>Sweep Freq Range: Dc to 30 mc. |
| 6625-716-0883 | Preamplifier, Type 53/54A (used with 545A oscilloscope) | Preamplifier | Tektronix Inc, Beaverton, Oregon | Sensitivity: 0.005 volt/cm max.<br>Freq Range: Dc to 20 mc.<br>Input Impedance: 10 megohms, 11.5 uuf (with P6000 probe). |
| 6625-707-8000 | Probe, Attenuator, Type P6000 | 10:1 Attenuator Probe | Tektronix Inc, Beaverton, Oregon | Attenuation: 10:1<br>Impedance: 10 megohms, 11.5 uuf. |
| | Amplifier, Power, Signal Generator, Type 230-A | Rf Amplifier | Boonton Radio Corp., Boonton, New Jersey | Bandwidth: 10 to 500 mc.<br>Voltage Gain: 34 db.<br>Output Voltage: 10 volts peak.<br>Impedance: 50 ohms input and output. |
| 6625-556-8958 | Meter, Audio Level, Type TS-399/U | Power Output Meter | | Impedance Range: 2.5 to 20,000 ohms.<br>Power Range: 0.1 milliwatt to 50 watts, ±2 percent, from 50 to 8000 cps. |

*Table 5-1. Test Equipment Required (Cont)*

| STOCK NUMBER | EQUIPMENT NOMENCLATURE | COMMON NAME | MANUFACTURER | REQUIRED CHARACTERISTICS |
|---|---|---|---|---|
| | Oscillator, Audio Type AN/URM-127 | Audio Oscillator | | Freq Range: 20 to 40,000 cps.<br>Output Power: 1 watt into a 600-ohm load.<br>Internal Impedance: 75 ohms (approx) from 20 to 20,000 cps.<br>Output Impedance: 600 ohms.<br>Hum Output: At least 66 db below rated output. |
| | Test Panel (to be constructed as shown in figure 5-1) | Test Panel | | |
| 6625-993-3389 | Test Set, Transistor, Type 1890M | Test Set | | $I_{CBO}$ Scales: 0-50 ua, 500 ua, and 5 ma.<br>$I_C$ Scales: 0-1.0, 10, and 100 ma.<br>Beta Ranges: 0-50, 100, 200, and 400. |
| | Test Cable, Coaxial | Coaxial Cable | | 3 ft lg, RG-58/U with UG-88C/U connector at both ends. |
| | Test Cable, Coaxial | Coaxial Cable | | 2 ft lg, RG-58/U with a UG-88C/U connector at one end and two alligator clips at other end. |
| | Capacitor, Mica | 10 uuf Capacitor | | 10 uuf. |
| | Capacitor, Mica | 1000 uuf Capacitor | | 1000 uuf. |
| | Capacitor, Electrolytic | 10 uf Capacitor | | 10 uf. |
| | Adapter, Connector, UG-349A/U | UG-349A/U Adapter | | Impedance: 50 ohms.<br>Configuration: straight type BNC (male) to type N (female). |
| | Adapter, Connector UG-606/U | UG-606/U Adapter | | Impedance: 50 ohms.<br>Configuration: straight type BNC (female) to type N (female). |

*Table 5-2. Test Points*

| TEST POINT | LOCATION | CIRCUIT |
|---|---|---|
| TP1 | Rf and Mixer Subassembly | 1st rf amplifier input |
| TP2 | Rf and Mixer Subassembly | Emitter of 1st rf amplifier |
| TP3 | Rf and Mixer Subassembly | 2nd rf amplifier output |
| TP4 | Rf and Mixer Subassembly | Emitter of 2nd rf amplifier |
| TP5 | Rf and Mixer Subassembly | Base of mixer |
| TP6 | Rf and Mixer Subassembly | Emitter of mixer |
| TP7 | Rf and Mixer Subassembly | Agc voltage |
| TP8 | Oscillator Circuit Board 117580 | Local oscillator |
| TP9 | Oscillator Circuit Board 117580 | Output of oscillator |
| TP10 | Oscillator Circuit Board 117580 | Ground |

*Table 5-2. Test Points (Cont)*

| TEST POINT | LOCATION | CIRCUIT |
|---|---|---|
| TP11 | Oscillator Circuit Board 117580 | Local oscillator |
| TP12 | Oscillator Circuit Board 117580 | Local oscillator |
| TP13 | I-f Circuit Board 117583 | 1st i-f amplifier |
| TP14 | I-f Circuit Board 117583 | 1st i-f amplifier |
| TP15 | I-f Circuit Board 117583 | 3rd i-f amplifier |
| TP16 | I-f Circuit Board 117583 | 4th i-f amplifier |
| TP17 | I-f Circuit Board 117583 | Agc voltage |
| TP18 | I-f Circuit Board 117583 | Audio and agc detector |
| TP19 | I-f Circuit Board 117583 | 2nd agc amplifier |
| TP20 | I-f Circuit Board 117583 | Squelch amplifier |
| TP21 | I-f Circuit Board 117583 | Squelch gate input |
| TP22 | I-f Circuit Board 117583 | 1st audio amplifier input |
| TP23 | Power Supply and Audio Circuit Board 117587 | 2nd audio amplifier output |
| TP24 | Power Supply and Audio Circuit Board 117587 | Base of audio output amplifier |
| TP25 | Power Supply and Audio Circuit Board 117587 | Base of audio output amplifier |
| TP26 | Power Supply and Audio Circuit Board 117587 | Collector of audio output amplifier |
| TP27 | Power Supply and Audio Circuit Board 117587 | Collector of audio output amplifier |
| TP28 | Power Supply and Audio Circuit Board 117587 | Unregulated dc supply bus |
| TP29 | Power Supply and Audio Circuit Board 117587 | Series voltage regulator |
| TP30 | Power Supply and Audio Circuit Board 117587 | Regulator amplifier |
| TP31 | Power Supply and Audio Circuit Board 117587 | +20 volt regulated bus |

battery or dc generator is to be used as the primary power source, refer to figure 5-1 and connect the power source to terminal board TB1 on the test panel as follows: positive lead to terminal 1 and negative lead to terminal 2. Turn the primary power source on.

c. Connect the test equipment to the receiver as shown in figure 5-2.

d. Make the following switch and control settings on the test panel.

(1) REMOTE RF GAIN control to the full clockwise position.

(2) REMOTE SQUELCH switch to the OFF position.

(3) LOW LEVEL AUDIO LOAD switch to the OFF position.

(4) MAIN AUDIO LOAD switch to the OFF position.

e. Set the load selector switch on the power output meter to the 600-ohm position and the scale multiplier to the 100 position (full scale reading of five watts).

f. Set the receiver AUDIO GAIN control to position 1. The POWER indicator lamp on the receiver shall glow. The test panel AGC meter shall indicate 20 volts, ±5 percent.

g. Refer to figure 5-3, use the vtvm, and measure the voltage from test point TP31 to chassis ground. The vtvm shall indicate +20 volts dc, ±5 percent.

h. Turn the signal generator on and adjust to the channel frequency of the receiver.

## 5-16. AUDIO POWER OUTPUT.

a. Set the signal generator for a 1000-microvolt output signal, modulated 30 percent at 1000 cps.

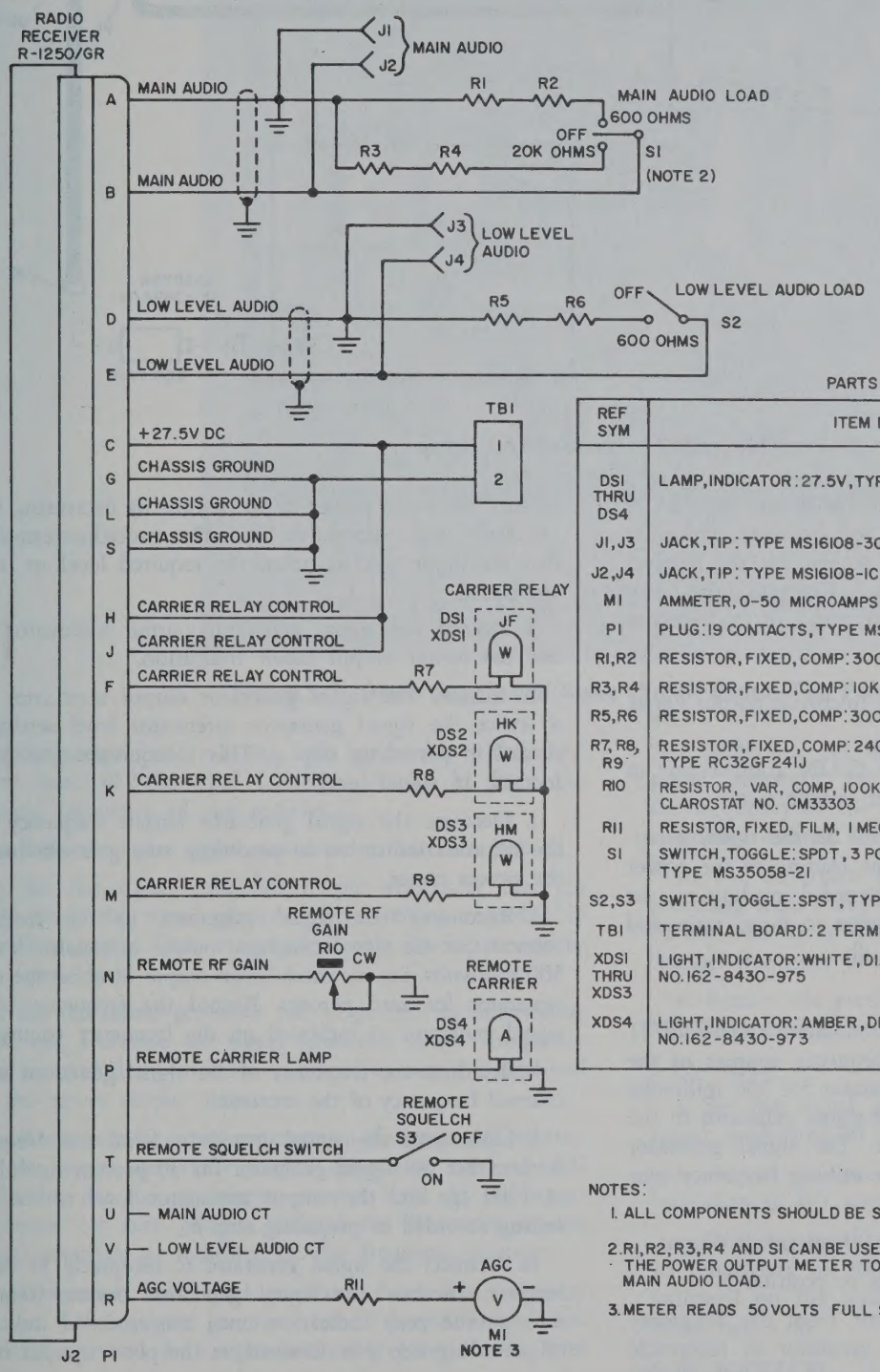
b. Set the receiver AUDIO GAIN control to position 5.

c. Readjust the signal generator frequency control for a maximum output indication on the power output meter.

d. The power output meter shall indicate 1 watt or greater.

e. Disconnect the power output meter from the MAIN AUDIO jacks on the test panel, and reconnect to the LOW LEVEL jacks on the test panel. Set the scale multiplier to the 0.1 position (5 milliwatts full scale).

f. Disconnect the headset from the receiver. The power output meter indication shall be 1 milliwatt or greater.




PARTS LIST

| REF SYM | ITEM DESCRIPTION |
|---|---|
| DS1 THRU DS4 | LAMP, INDICATOR: 27.5V, TYPE MS25237-327 |
| J1, J3 | JACK, TIP: TYPE MS16108-3C |
| J2, J4 | JACK, TIP: TYPE MS16108-1C |
| M1 | AMMETER, 0-50 MICROAMPS DC, TYPE MR36W050DCUAR |
| P1 | PLUG: 19 CONTACTS, TYPE MS3116F-14-19S |
| R1, R2 | RESISTOR, FIXED, COMP: 300 OHMS, 2W, TYPE RC42GF301J |
| R3, R4 | RESISTOR, FIXED, COMP: 10K OHMS, 2W, TYPE RC42GF103J |
| R5, R6 | RESISTOR, FIXED, COMP: 300 OHMS, 1/2W, TYPE RC20GF301J |
| R7, R8, R9 | RESISTOR, FIXED, COMP: 240 OHMS, 1W, TYPE RC32GF241J |
| R10 | RESISTOR, VAR, COMP, 100K OHMS, 2W, LINEAR TAPER, CLAROSTAT NO. CM33303 |
| R11 | RESISTOR, FIXED, FILM, 1 MEG, 1%, 1/4W, TYPE RN65C1004F |
| S1 | SWITCH, TOGGLE: SPDT, 3 POS CENTER OFF, TYPE MS35058-21 |
| S2, S3 | SWITCH, TOGGLE: SPST, TYPE MS35058-22 |
| TB1 | TERMINAL BOARD: 2 TERMINALS, H.B. JONES NO. 141-2 |
| XDS1 THRU XDS3 | LIGHT, INDICATOR: WHITE, DIALIGHT CORP. NO. 162-8430-975 |
| XDS4 | LIGHT, INDICATOR: AMBER, DIALIGHT CORP. NO. 162-8430-973 |

NOTES:

1. ALL COMPONENTS SHOULD BE SCREENED AS INDICATED.
2. R1, R2, R3, R4 AND S1 CAN BE USED IN THE ABSENCE OF THE POWER OUTPUT METER TO PROVIDE A PROPER MAIN AUDIO LOAD.
3. METER READS 50 VOLTS FULL SCALE.

*Figure 5-1. Test Panel, Schematic Diagram*

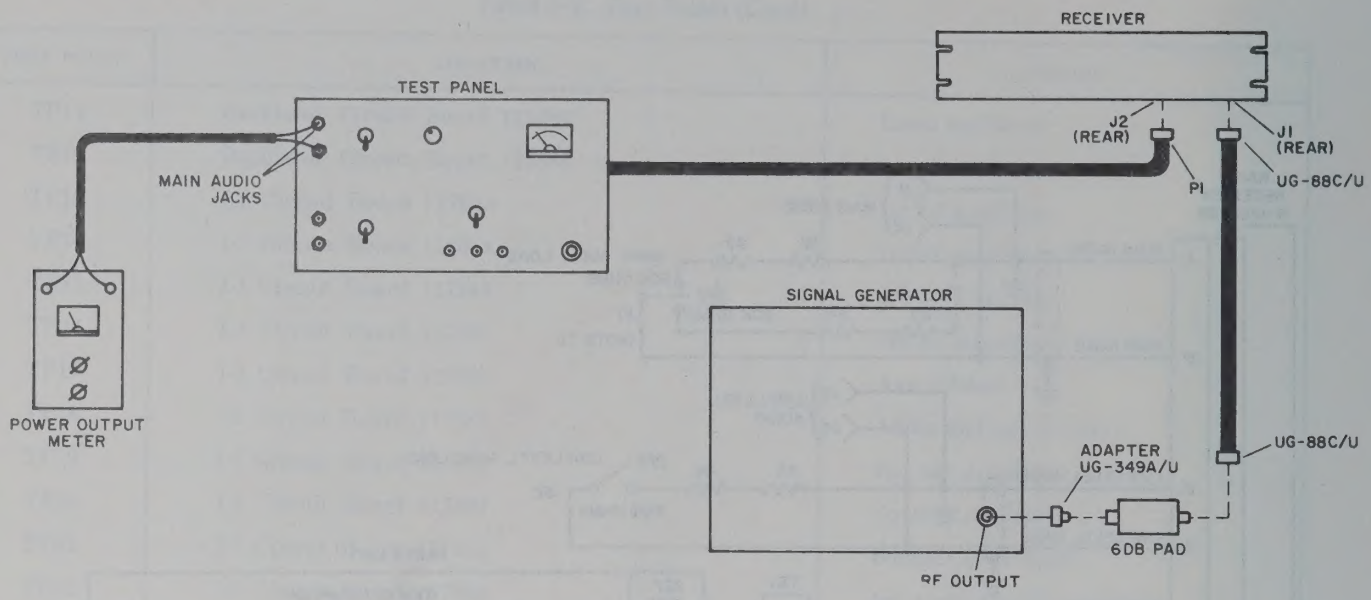



*Figure 5-2. Standard Test Setup*

g. Reconnect the power output meter to the MAIN AUDIO jacks on the test panel. Set the scale multiplier to the 100 position (5 watts full scale). Set the receiver AUDIO GAIN control to position 1. Reconnect the headset to the PHONE jack on the front panel of the receiver.

5-17. SENSITIVITY.

a. Set the signal generator for a 5-microvolt output signal, modulated 30 percent at 1000 cps.

b. Adjust the receiver AUDIO GAIN control for an indication of 1 watt on the power output meter.

c. Set the modulation level control on the signal generator for zero percent, and record the reading of the power output meter. The ratio of the recorded reading to the 1-watt reading is the signal-plus-noise to noise ratio and the difference shall be at least 10 db.

5-18. SELECTIVITY.

a. Disconnect the signal generator from receptacle J1 on the receiver and connect the frequency counter to the signal generator. Set the signal generator for 500 millivolts output. Adjust the frequency of the signal generator to the channel frequency of the receiver. The signal generator output frequency is the sum of the mixing frequency plus the frequency counter indication.

b. Set the signal generator for a 0.1-microvolt output.

c. Set the AUDIO GAIN control to position 5.

d. Disconnect the signal generator from the frequency counter, and reconnect the signal generator to receptacle J1 on the receiver. Set the signal generator output for 30 percent modulation at 1000 cps.

e. Set the SQUELCH switch to the ON/MUTING position. Slowly increase the signal generator output until the CARRIER indicator lamp is illuminated.

f. Note the audio power as indicated on the power output meter. Set the SQUELCH switch to the OFF position. Reduce the audio power to 50 percent by decreasing signal generator output attenuator level. This procedure established that the input level is below the required level to initiate agc action.

g. Record the signal generator output attenuator level and the power output meter indication.

h. Increase the signal generator output attenuator level to twice the signal generator attenuator level setting recorded in preceding step *g*. This is equivalent to a 6-db increase in signal level.

i. Decrease the signal generator output frequency until the recorded indication in preceding step *g* is obtained on the power meter.

j. Reconnect the signal generator to the frequency counter. Set the signal generator output attenuator level to 500 millivolts. Set the modulation output level on the signal generator for zero percent. Record the frequency of the signal generator as indicated on the frequency counter.

k. Readjust the frequency of the signal generator to the channel frequency of the receiver.

l. Disconnect the signal generator from the frequency counter. Set the signal generator for 30 percent modulation at 1000 cps and the output attenuator level to the level setting recorded in preceding step *h*.

m. Connect the signal generator to receptacle J1 on the receiver. Increase the signal generator output frequency through the peak indication until the recorded indication of preceding step *g* is obtained on the power output meter.

n. Reconnect the signal generator to the frequency counter INPUT jack. Set the signal generator output attenuator level to 500 millivolts. Set the modulation output level on the signal generator for zero percent. Record the frequency of the signal generator as indicated on the frequency counter.

o. The difference between the recorded frequencies of

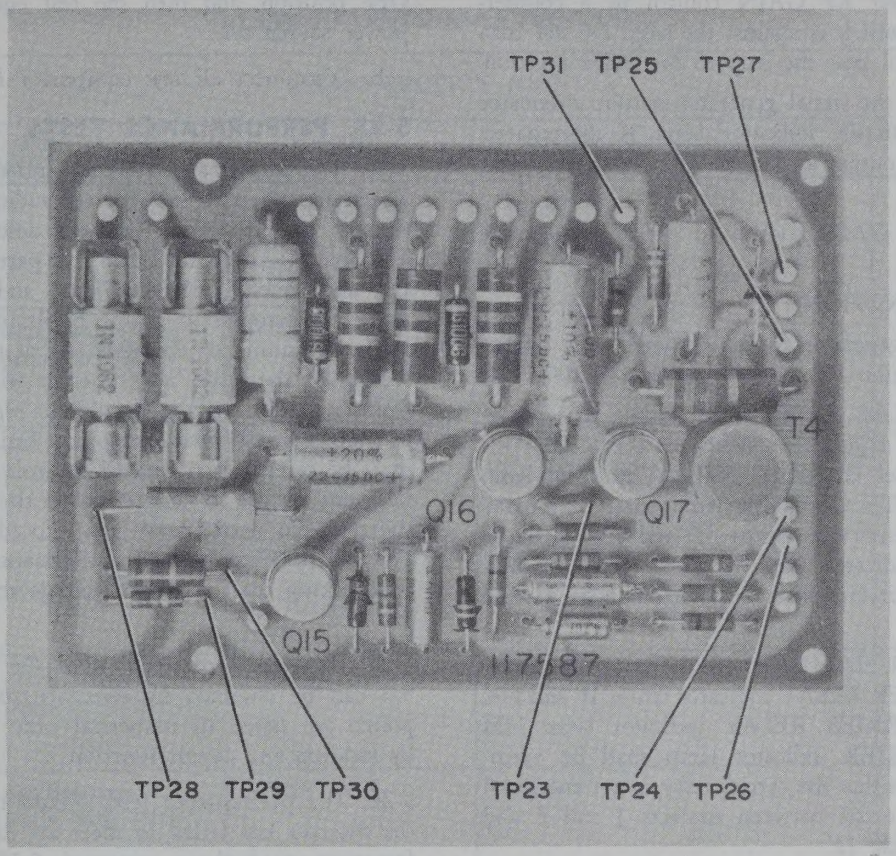



***Figure 5-3. Power Supply and Audio Circuit Board, Test Point Locations***

preceding steps *j* and *n* is the 6-db bandwidth, which shall be at least 30.2 kc wide (centered ±15.1 kc from the channel frequency of the receiver).

p. Reconnect the signal generator to receiver jack J1.

q. Set the signal generator output attenuator level to 1000 times the signal generator level setting recorded in preceding step *g*. This is equivalent to a 60-db increase in the signal level.

r. Set the signal generator for 30 percent modulation at 1000 cps. Decrease the signal generator output frequency until the recorded indication in preceding step *g* is obtained on the power output meter.

s. Reconnect the signal generator to the frequency counter. Set the signal generator output attenuator level to 500 millivolts. Set the modulation output level on the signal generator for zero percent. Record the frequency of the signal generator as indicated on the frequency counter.

t. Disconnect the signal generator from the frequency counter. Set the signal generator for 30 percent modulation at 1000 cps and the output attenuator level to the level setting recorded in preceding step *q*.

u. Connect the signal generator to receptacle J1 on the receiver. Increase the signal generator output frequency until the recorded indication in preceding step *g* is obtained on the power output meter.

*v*. Reconnect the signal generator to the frequency counter. Set the signal generator output attenuator level to 500 millivolts. Set the modulation output level on the signal generator for zero percent modulation. Record the frequency of the signal generator as indicated on the frequency counter.

w. The difference between the recorded frequencies of preceding steps *s* and *v* is the 60-db bandwidth, which shall be less than 63 kc wide (centered within ±31.5 kc of the channel frequency of the receiver).

x. Return the receiver SQUELCH switch to the ON/MUTING position.

5-19. AGC.

a. Set the signal generator for a 15-microvolt output signal, modulated 30 percent at 1000 cps.

b. Adjust the receiver AUDIO GAIN control for an indication of 0.5 watt on the power output meter.

c. Vary the signal generator output attenuator level from 15 microvolts to 500 millivolts. The receiver output, as indicated on the power output meter, shall not vary by more than 3 db.

5-20. SQUELCH.

a. Set the signal generator for a 0.1-microvolt output signal, modulated 30 percent at 1000 cps.

b. Slowly increase the signal generator output attenuator level until the receiver CARRIER indicator lamp is illuminated. The signal generator output attenuator level shall not be greater than 3 microvolts.

c. Turn the receiver RF GAIN control in a counterclockwise direction until it is against the stop. *Do not* turn the RF GAIN control past the stop to the REM position.

d. Slowly increase the signal generator output attenuator level until the CARRIER indicator lamp is illuminated. The signal generator output attenuator level shall be greater than 60 microvolts.

e. Return the RF GAIN control to the full clockwise position.

5-21. REMOTE FUNCTIONS.

a. Set the signal generator for a zero-microvolt output signal and a modulation level of 30 percent at 1000 cps.

b. Set the receiver RF GAIN control to the REM position and the receiver SQUELCH switch to the REM position. On the test panel, CARRIER RELAY indicator lamp HM and the REMOTE CARRIER lamp shall illuminate. CARRIER RELAY indicator lamps JF and HK shall be extinguished. This indicates that the carrier relay is energized and a closed circuit exists between contacts H and M on receptacle J2.

c. Set the REM SQUELCH switch on the test panel to the ON position. CARRIER RELAY indicator lamps JF and HK shall illuminate, CARRIER RELAY indicator lamp HM and the REM CARRIER indicator lamp shall be extinguished. This indicates that the carrier relay is not energized and a closed circuit exists between contacts J and F and H and K on receptacle J2.

d. Set the RF GAIN control on the test panel to the maximum clockwise position.

e. Slowly increase the signal generator output attenuator level until an indication is observed on the power output meter. The signal generator output attenuator level shall not be greater than 3 microvolts. The test panel indicator lamps shall be as indicated in preceding step *b*.

5-22. FINAL PROCEDURE.

a. Set the receiver AUDIO GAIN control to the PWR OFF position, and turn the test equipment and primary power source off.

b. Disconnect all test equipment from the receiver.

## 5-23. PERFORMANCE TESTS.

5-24. The performance tests use signal injection techniques. The tests start with the receiver audio section and progress through the rf section. The tests described in performance test table 5-3 are divided into four parts: (1) audio, (2) i-f, agc, and squelch, (3) oscillator, and (4) rf and mixer. After the completion of the preliminary procedures given at the beginning of the table and at the beginning of each section of the table, it is possible to make a specific test from any step in the table without regard to what precedes or follows it. However, when you finish a specific test, you must be careful to return all controls to their former positions and restore all connections as they were before starting the test. No performance test procedure is given for the power supply section, as this section can be serviced strictly by checking the applicable voltage measurements in table 5-4.

5-25. Description of the POINT OF TEST listed in table 5-3 can be obtained by reference to table 5-2. The test points are listed in numerical order and identified both by location and circuit function.

5-26. The performance tests should be performed only if the receiver has failed to meet any of the minimum performance standards in paragraph 5-12. If the receiver has failed to meet a particular test in the minimum performance tests, the trouble can usually be localized to a section in the receiver by analysis of the block diagram in figure 6-1. Then, by means of the test points listed in table 5-2 and the schematic diagram in figure 6-2, select the component or circuit you want to investigate. Refer to table 5-3 and perform the applicable test. When a defective stage is located, use normal trouble shooting techniques and the voltage measurements in table 5-4 to isolate the trouble to a specific part or parts.

*Table 5-3. Performance Tests*

| | |
|---|---|
| PRELIMINARY INSTRUCTIONS: | Remove the equipment covers from the top and bottom of the receiver.<br>Perform the preparatory procedures given in paragraph 5-15.<br>After completion of performance tests, set the receiver AUDIO GAIN control to the PWR OFF position, turn the test equipment and primary power source off, and disconnect the test equipment from the receiver. |
| AUDIO SECTION | |
| PRELIMINARY INSTRUCTIONS: | Set the signal generator for zero microvolts output.<br>Connect the audio oscillator output through a 10-ufd capacitor to TP22, figure 5-4.<br>Adjust the audio oscillator for an output of 1.5 volts peak-to-peak at 1000 cps.<br>Set the receiver AUDIO GAIN control to position 3.<br>Set the oscilloscope for MAIN SWEEP NORMAL and INT. SYNC.<br>When you have completed the tests in this section, disconnect the test equipment from the receiver. |

*Table 5-3. Performance Tests (Cont)*

| AUDIO SECTION (CONT) | | | | |
|---|---|---|---|---|
| STEP | OPERATION OF TEST EQUIPMENT | POINT OF TEST | CONTROL SETTINGS AND OPERATION OF EQUIPMENT | PERFORMANCE STANDARDS |
| 1A | None | MAIN AUDIO jacks on test panel | None | 1 watt output |
| 1B | Connect the oscilloscope 10:1 attenuator probe to TP23, figure 5-3. | TP23 | None | 3.5 ±0.35 volts peak-to-peak |
| 1C | Connect the oscilloscope 10:1 attenuator probe to TP24, figure 5-3. | TP24 | None | 1.2 ±0.1 volts peak-to-peak |
| 1D | Connect the oscilloscope 10:1 attenuator probe to TP25, figure 5-3. | TP25 | None | 1.2 ±0.1 volts peak-to-peak |
| 1E | Connect the oscilloscope 10:1 attenuator probe to TP26, figure 5-3. | TP26 | None | 28 ±2.8 volts peak-to-peak |
| 1F | Connect the oscilloscope 10:1 attenuator probe to TP27, figure 5-3. | TP27 | None | 28 ±2.8 volts peak-to-peak |
| 1G | Disconnect the audio oscillator from TP22.<br>Reconnect the audio oscillator through a 10-ufd capacitor to TP18.<br>Adjust the audio oscillator for an output of 2.5 volts peak-to-peak.<br>At the conclusion of the test, reconnect the audio oscillator to TP22 through a 10-ufd capacitor. | MAIN AUDIO jacks on test panel | Set the receiver squelch switch to the OFF position. | 1 watt output |
| 1H | Perform step 1G.<br>Connect the oscilloscope 10:1 attenuator probe to TP21, figure 5-4. | TP21 | Same as 1G | 1.7 ±0.2 volts peak-to-peak |
| 1I | Perform step 1G.<br>Connect the oscilloscope 10:1 attenuator probe to TP22, figure 5-4. | TP22 | Same as 1G | 1.4 ±0.2 volts peak-to-peak |

*Table 5-3. Performance Tests (Cont)*

| OSCILLATOR SECTION | | | | |
|---|---|---|---|---|
| PRELIMINARY INSTRUCTIONS: | Adjust the signal generator for zero microvolts output. | | | |
| STEP | OPERATION OF TEST EQUIPMENT | POINT OF TEST | CONTROL SETTINGS AND OPERATION OF EQUIPMENT | PERFORMANCE STANDARDS |
| 2A | Set the vtvm to the 1-volt ac scale.<br>Connect the vtvm to TP8 and TP10, figure 5-5. | TP8 | None | 0.2 to 0.4 volt rms |
| 2B | Connect the test equipment as shown in figure 5-6.<br>Connect the inner conductor of the RG-58/U coaxial cable through the 10-uuf capacitor to TP9 and the outer conductor to TP10. | TP9 | None | Channel frequency minus 17 mc, ±0.001 percent of channel frequency |
| I-F, AGC, AND SQUELCH SECTION | | | | |
| PRELIMINARY INSTRUCTIONS: | Remove the coaxial cable that is connected between receiver receptacle J1 and the 6-db attenuator.<br>Use the RG-58/U coaxial cable that is terminated with a UG-88C/U connector on one end and two alligator clips on the other end, and connect this cable to the 6-db attenuator.<br>Connect the center conductor of the coaxial cable through a 1000-uuf capacitor to TP13, figure 5-4, and the outer conductor to chassis ground.<br>At the conclusion of the tests in this section, reconnect the test equipment as shown in figure 5-2. | | | |
| STEP | OPERATION OF TEST EQUIPMENT | POINT OF TEST | CONTROL SETTINGS AND OPERATION OF EQUIPMENT | PERFORMANCE STANDARDS |
| 3A | Set the signal generator to 17 mc, and adjust for a 20-microvolt output, modulated 30 percent at 1000 cps. | MAIN AUDIO jacks on the test panel | Set the receiver SQUELCH switch to the OFF position.<br>Set the RF GAIN control to the maximum clockwise position.<br>Set the AUDIO GAIN control to maximum clockwise position. | 1 watt output |
| 3B | Set the signal generator for a 50-microvolt output, modulated 30 percent at 1000 cps.<br>Set the vtvm to the 30-volt dc scale.<br>Connect the vtvm to TP19, figure 5-4. | TP19 | Set the RF GAIN control to the maximum clockwise position.<br>Set the AUDIO GAIN control to position 4.<br>Set the SQUELCH switch to the ON/MUTING position. | 13.5 ±1.4 volts dc |
| 3C | Set the signal generator for a 50-microvolt output, modulated 30 percent at 1000 cps.<br>Set the vtvm to the 30-volt dc scale.<br>Connect the vtvm to TP17, figure 5-4. | TP17 | None | 15 ±1.5 volts dc |

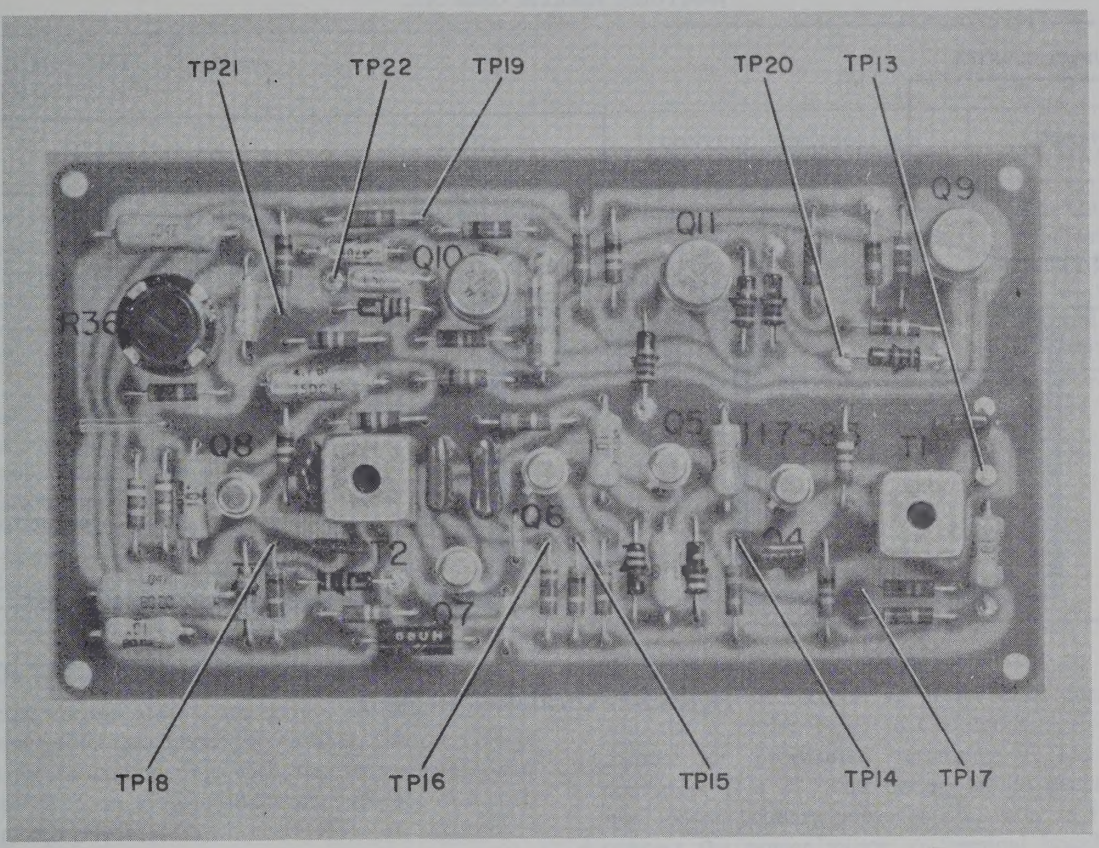



*Figure 5-4. I-f and Agc Circuit Board, Test Point Locations*

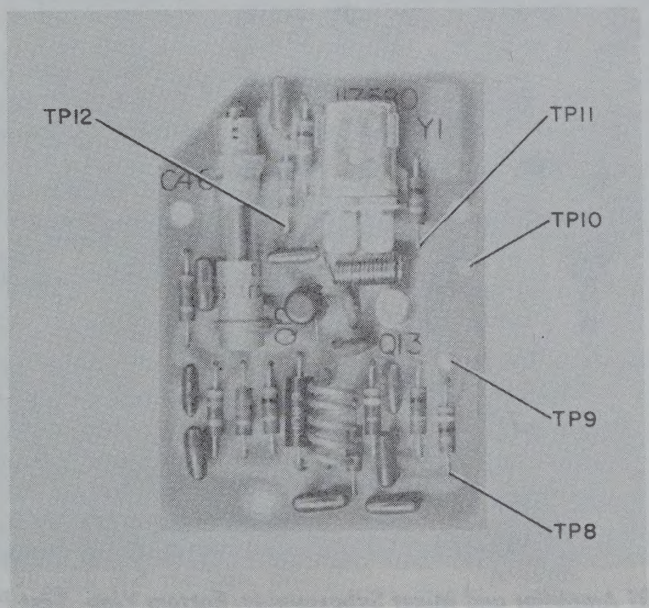



*Figure 5-5. Oscillator Circuit Board, Test Point Locations*

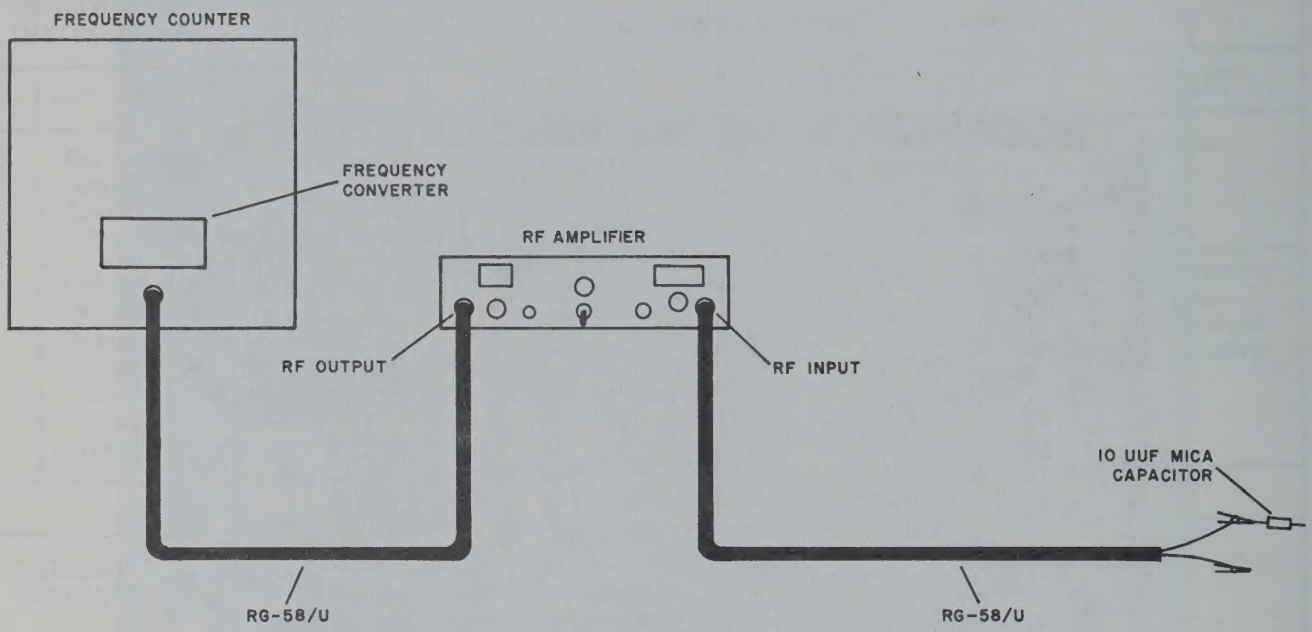



*Figure 5-6. Oscillator Test Setup*

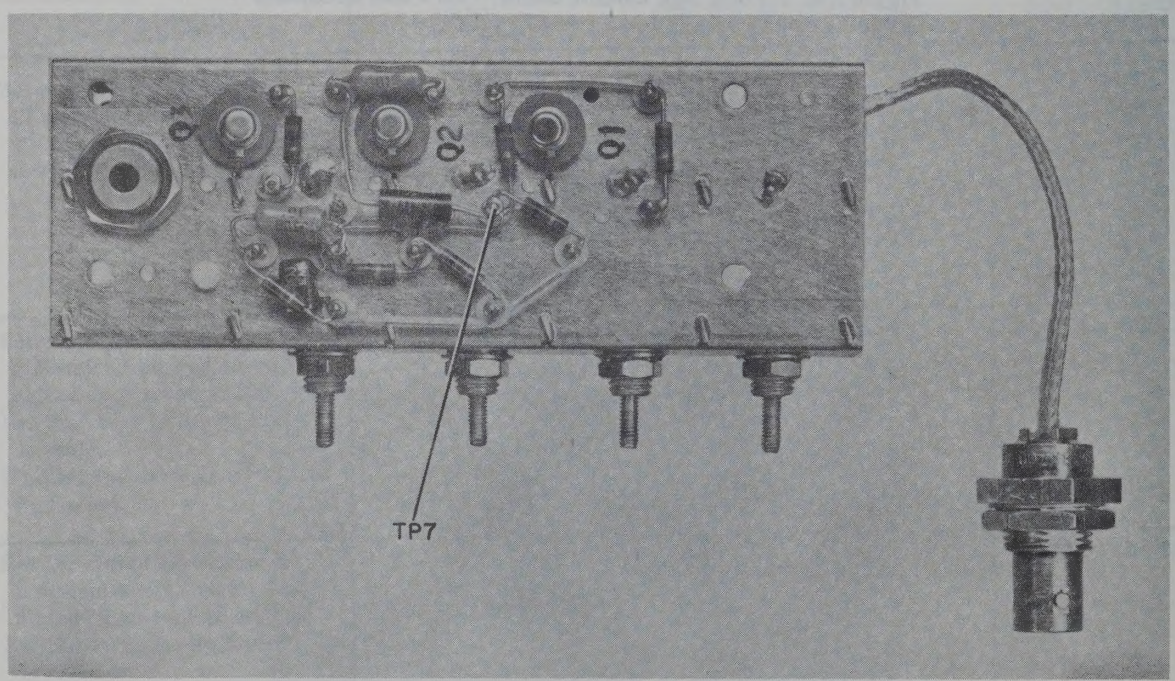



***Figure 5-7. Rf Amplifier and Mixer Subassembly, Bottom View, Test Point Location***

*Table 5-3. Performance Tests (Cont)*

| RF AND MIXER SECTION | | | | |
|---|---|---|---|---|
| | PRELIMINARY INSTRUCTIONS: None. | | | |
| STEP | OPERATION OF TEST EQUIPMENT | POINT OF TEST | CONTROL SETTINGS AND OPERATION OF EQUIPMENT | PERFORMANCE STANDARDS |
| 4A | Set the signal generator for zero microvolts output. Slowly adjust the signal generator output level until the receiver CARRIER indicator lamp starts to glow. | CARRIER indicator lamp DS2 | None | The CARRIER indicator lamp shall glow with a minimum input signal of 10 microvolts. |
| 4B | Set the signal generator for a 1000-microvolt output, modulated 30 percent at 1000 cps. Set the vtvm to the 30-volt dc scale. Connect the vtvm to TP7, figure 5-7. | TP7 | None | 9.5 ±1 volts dc |

## 5-27. VOLTAGE MEASUREMENTS.

5-28. Voltage measurements are given in table 5-4 for pertinent test points throughout the receiver. Use the voltage measurements, in conjunction with the performance tests in paragraph 5-23, to localize and isolate trouble in a malfunctioning equipment.

5-29. The voltage measurements in table 5-4 are typical and may vary due to component tolerances. Measurements are made without a signal applied to the input of the receiver. The voltage measurements are divided into five parts: (1) rf and mixer, (2) oscillator, (3) i-f, agc, and squelch, (4) audio, and (5) power supply. After completion of the preliminary procedures given at the beginning of the table and at the beginning of each section of the table, it is possible to make a specific measurement from any step in the table without regard to what precedes or follows it. After completing measurements in a particular section, be careful to return all controls to their former positions and restore all parts and connections as they were before starting measurements.

## 5-30. ALIGNMENT.

5-31. Complete alignment of the receiver can be accomplished by performing the following procedures in sequence. These procedures involve the steps which are required to install (or replace) the local oscillator crystal in the receiver and to properly align the receiver on the desired channel frequency. To align a particular circuit, perform the preparatory procedures of paragraph 5-32, the paragraph(s) pertaining to the circuit to be aligned, and the final procedure in paragraph 5-39.

5-32. PREPARATORY PROCEDURES. Complete the following steps to prepare the receiver for alignment:

a. Connect the primary power source to the receiver. If an ac source is to be used for primary power, insert plug P1 on the receiver ac power cable (see figure 5-8) into the ac outlet. Refer to Chapter 2, Section III, of this manual for information pertaining to 115- or 230-volt operation. If a 27.5-volt battery or dc generator is to be used as the primary power source, refer to figure 5-1 and connect the power source to terminal board TB1 on the test panel as follows: positive lead to terminal 1 and negative lead to terminal 2. Turn the primary power source on.

b. Connect the test equipment to the receiver as shown in figure 5-2.

c. Refer to figure 3-1, and make the following switch and control settings on the front panel of the receiver.

(1) AUDIO GAIN control to the PWR OFF position.

(2) RF GAIN control to the full clockwise position.

(3) SQUELCH switch to the OFF position.

d. Make the following switch and control settings on the test panel.

(1) MAIN AUDIO LOAD switch to the OFF position.

(2) LOW LEVEL AUDIO LOAD switch to the OFF position.

(3) REMOTE SQUELCH switch to the OFF position.

(4) REMOTE RF GAIN control to the full clockwise position.

e. Set the load selector switch on the power output meter to the 600-ohm position, and set the scale multiplier selector to the 100 position (full scale reading of five watts).

f. Turn the signal generator on, and set the frequency

*Table 5-4. Voltage Measurements*

| | |
|---|---|
| PRELIMINARY INSTRUCTIONS: | Remove the equipment covers from the top and bottom of the receiver.<br>Connect test panel connector P1 to receiver receptacle J2.<br>Make the following switch and control settings on the front panel of the receiver: AUDIO GAIN control to the PWR OFF position, RF GAIN control to the full clockwise position, and SQUELCH switch to the OFF position.<br>Connect the receiver to the ac or dc primary power source, and turn the power source on.<br>Set the receiver AUDIO GAIN control to position 1; the POWER indicator lamp should glow and the test panel AGC meter should indicate approximately 20 volts.<br>After completing voltage measurements, set the receiver AUDIO GAIN control to the PWR OFF position.<br>Disconnect the receiver from the test panel. Replace the top and bottom equipment covers on the receiver. |

RF AND MIXER SECTION

| | |
|---|---|
| PRELIMINARY INSTRUCTIONS: | Refer to figure 5-8, and remove the rf shield cover.<br>After completing the rf and mixer voltage measurements, replace the rf shield cover. |

| STEP | OPERATION OF TEST EQUIPMENT | POINT OF TEST | TYPICAL VOLTAGE |
|---|---|---|---|
| 1A | Set the vtvm to the 30-volt dc scale.<br>Connect the vtvm from TP1, figure 5-9, to chassis ground. | TP1 | 11.5 volts |
| 1B | Set the vtvm to the 30-volt dc scale.<br>Connect the vtvm from TP2, figure 5-9, to chassis ground. | TP2 | 11.7 volts |
| 1C | Set the vtvm to the 30-volt dc scale.<br>Connect the vtvm from TP3, figure 5-9, to chassis ground. | TP3 | 11.5 volts |
| 1D | Set the vtvm to the 30-volt dc scale.<br>Connect the vtvm from TP4, figure 5-9, to chassis ground. | TP4 | 11.9 volts |
| 1E | Set the vtvm to the 30-volt dc scale.<br>Connect the vtvm from TP5, figure 5-9, to chassis ground. | TP5 | 13.5 volts |
| 1F | Set the vtvm to the 30-volt dc scale.<br>Connect the vtvm from TP6, figure 5-9, to chassis ground. | TP6 | 13.8 volts |
| 1G | Set the vtvm to the 30-volt dc scale.<br>Connect the vtvm from TP7, figure 5-7, to chassis ground. | TP7 | 13.2 volts |

OSCILLATOR SECTION

| | |
|---|---|
| PRELIMINARY INSTRUCTIONS: | None. |

| STEP | OPERATION OF TEST EQUIPMENT | POINT OF TEST | TYPICAL VOLTAGE |
|---|---|---|---|
| 2A | Set the vtvm to the 3-volt dc scale.<br>Connect the vtvm from TP11, figure 5-5, to chassis ground. | TP11 | 1.9 volts |
| 2B | Set the vtvm to the 10-volt dc scale.<br>Connect the vtvm from TP12, figure 5-5, to chassis ground. | TP12 | 5.2 volts |

*Table 5-4. Voltage Measurements (Cont)*

| I-F, AGC, AND SQUELCH SECTION | | | |
|---|---|---|---|
| PRELIMINARY INSTRUCTIONS: | None. | | |
| STEP | OPERATION OF TEST EQUIPMENT | POINT OF TEST | TYPICAL VOLTAGE |
| 3A | Set the vtvm to the 1-volt dc scale. Connect the vtvm from TP13, figure 5-4, to chassis ground. | TP13 | 0 volts |
| 3B | Set the vtvm to the 30-volt dc scale. Connect the vtvm from TP14, figure 5-4, to chassis ground. | TP14 | 15.0 volts |
| 3C | Set the vtvm to the 30-volt dc scale. Connect the vtvm from TP15, figure 5-4, to chassis ground. | TP15 | 15.6 volts |
| 3D | Set the vtvm to the 10-volt dc scale. Connect the vtvm from TP16, figure 5-4, to chassis ground. | TP16 | 8.7 volts |
| 3E | Set the vtvm to the 30-volt dc scale. Connect the vtvm from TP17, figure 5-4, to chassis ground. | TP17 | 15.5 volts |
| 3F | Set the vtvm to the 30-volt dc scale. Connect the vtvm from TP18, figure 5-4, to chassis ground. | TP18 | 20 volts |
| 3G | Set the vtvm to the 30-volt dc scale. Connect the vtvm from TP19, figure 5-4, to chassis ground. | TP19 | 20 volts |
| 3H | Set the vtvm to the 3-volt dc scale. Connect the vtvm from TP20, figure 5-4, to chassis ground. | TP20 | 0.99 volt |
| 3I | Set the vtvm to the 30-volt dc scale. Connect the vtvm from TP21, figure 5-4, to chassis ground. | TP21 | 9.4 volts |
| 3J | Set the vtvm to the 3-volt dc scale. Connect the vtvm from TP22, figure 5-4, to chassis ground. | TP22 | 0 volts |
| AUDIO SECTION | | | |
| PRELIMINARY INSTRUCTIONS: | None. | | |
| STEP | OPERATION OF TEST EQUIPMENT | POINT OF TEST | TYPICAL VOLTAGE |
| 4A | Set the vtvm to the 30-volt dc scale. Connect the vtvm from TP23, figure 5-3, to chassis ground. | TP23 | 19.6 volts |
| 4B | Set the vtvm to the 1-volt dc scale. Connect the vtvm from TP24, figure 5-3, to chassis ground. | TP24 | 0.56 volt |
| 4C | Set the vtvm to the 1-volt dc scale. Connect the vtvm from TP25, figure 5-3, to chassis ground. | TP25 | 0.56 volt |
| 4D | Set the vtvm to the 30-volt dc scale. Connect the vtvm from TP26, figure 5-3, to chassis ground. | TP26 | 20 volts |
| 4E | Set the vtvm to the 30-volt dc scale. Connect the vtvm from TP27, figure 5-3, to chassis ground. | TP27 | 20 volts |

*Table 5-4. Voltage Measurements (Cont)*

| POWER SUPPLY SECTION | | | |
|---|---|---|---|
| PRELIMINARY INSTRUCTIONS: | None. | | |
| STEP | OPERATION OF TEST EQUIPMENT | POINT OF TEST | TYPICAL VOLTAGE |
| 5A | Set the vtvm to the 100-volt dc scale. Connect the vtvm from TP28, figure 5-3, to chassis ground. | TP28 | 33 volts *(27 volts) |
| 5B | Set the vtvm to the 100-volt dc scale. Connect the vtvm from TP29, figure 5-3, to chassis ground. | TP29 | 32 volts *(26.5 volts) |
| 5C | Set the vtvm to the 30-volt dc scale. Connect the vtvm from TP30, figure 5-3, to chassis ground. | TP30 | 20.8 volts |
| 5D | Set the vtvm to the 30-volt dc scale. Connect the vtvm from TP31, figure 5-3, to chassis ground. | TP31 | 20 volts |
| * If a 27.5-volt dc power source is used, the dc voltages in parenthesis should be indicated. | | | |

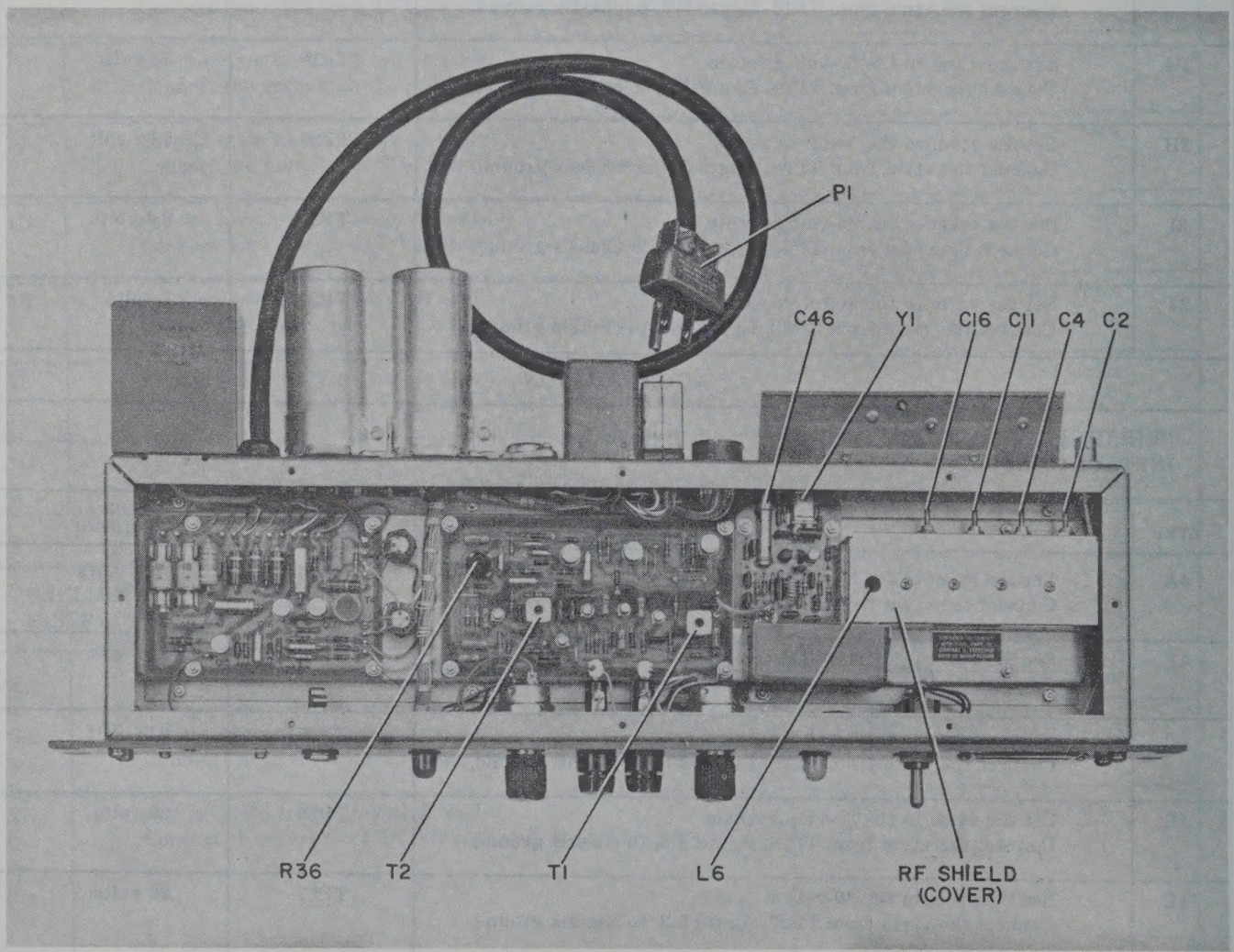



*Figure 5-8. Receiver, Tuning Control Locations*

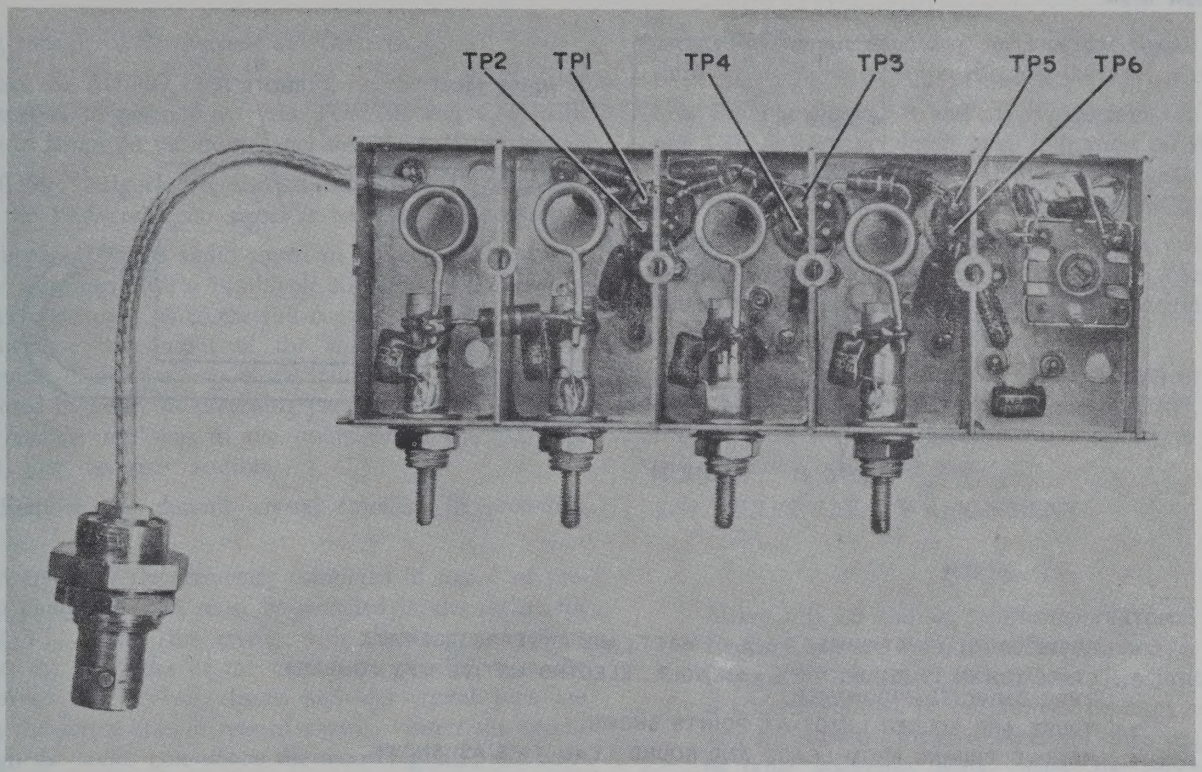



***Figure 5-9. Rf Amplifier and Mixer Subassembly, Top View, Test Point Locations***

of the signal generator to the channel frequency of the receiver.

g. Set the RF LEVEL control on the signal generator for maximum attenuation.

5-33. PRELIMINARY RF ADJUSTMENTS.

**CAUTION**

In subsequent step *a*, do not force the slugs of capacitors C2, C4, C11, and C16 beyond the mechanical stop at the full counterclockwise position.

a. Refer to figure 5-8, and adjust the slugs of capacitors C2, C4, C11, and C16 to the full counterclockwise position.

b. Use the following formula to compute the approximate number of *clockwise* turns required to set the slugs of capacitors C2, C4, C11, and C16 to the desired channel frequency:

$$T = \frac{151 \text{ mc} - F_C}{2.5 \text{ mc}}$$

T = Approximate number of required turns.

151 mc = Receiver frequency with capacitor slugs set to the full counterclockwise position.

$F_C$ = Desired channel frequency.

2.5 mc = Frequency change for one turn of capacitor slugs.

Example: Compute the approximate number of *clockwise* turns required to set the slugs of capacitors C2, C4, C11, and C16 to a channel frequency of 132.00 mc:

$$T = \frac{151.00 - 132.00}{2.5} = 7.6$$

**NOTE**

In subsequent step *c*, do not turn the slugs of capacitors C2, C4, C11, and C16 more than 17 turns in a clockwise direction from the full counterclockwise position, or false tuning indications may be obtained.

c. Adjust the slugs of capacitor C2, C4, C11, and C16 in a clockwise direction the number of turns computed in preceding step *b*.

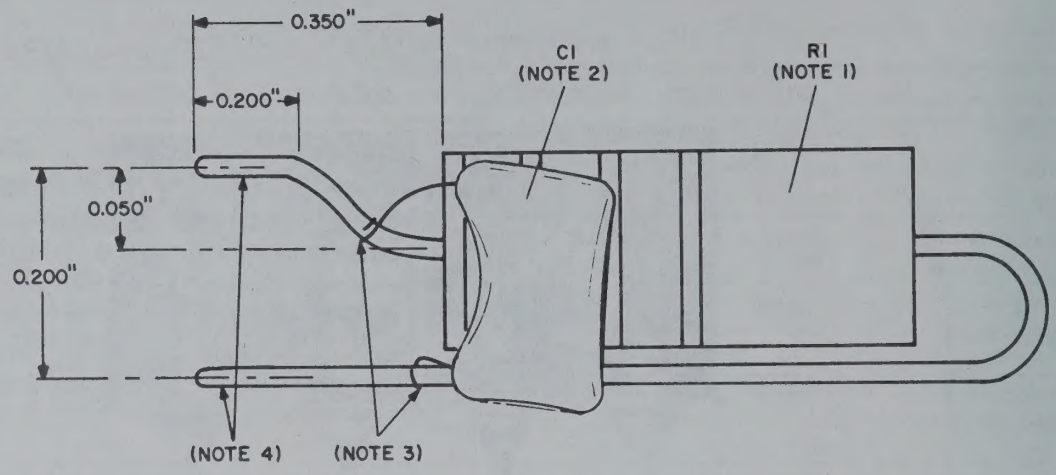
5-34. PRELIMINARY OSCILLATOR ADJUSTMENT.

**CAUTION**

In subsequent step *a*, do not force the slug of capacitor C46 beyond the mechanical stop at the full counterclockwise position.

a. Refer to figure 5-8, and adjust the slug of capacitor C46 to the full counterclockwise position.

b. Use the following formula to compute the required




NOTES:

1. RESISTOR R1 IS 47 OHMS, ±5%, 1 WATT, MIL TYPE RC32GF470J.
2. CAPACITOR C1 IS 15UUF, ±5%, 100 VOLT, ELECTRO MOTIVE MFG COMPANY TYPE DM10C150JP100WV4CR.
3. TWIST AND SOLDER LEADS AT POINTS SHOWN.
4. REMOVE TINNING FROM LEADS AND ROUND LEAD TIPS AS SHOWN.

*Figure 5-10. Dummy Crystal, Construction Details*

frequency of the local oscillator crystal at the desired channel frequency:

$$F_X = F_C - 17 \text{ mc}$$

$F_X$ = Required local oscillator crystal frequency in megacycles.

$F_C$ = Desired channel frequency.

17 mc = Receiver i-f frequency.

Example: Using 132.00 mc as the desired channel frequency, compute the required frequency of the local oscillator crystal.

$$F_X = 132.00 - 17.00 = 115.00 \text{ mc}$$

c. Use the following formula to compute the approximate number of clockwise turns required to set the slug of oscillator capacitor C46 to the crystal frequency determined in preceding step *b*:

$$T = \frac{134.00 \text{ mc} - F_X}{1.4 \text{ mc}}$$

T = Approximate number of required turns.

134.00 mc = Oscillator crystal frequency with slug of capacitor C46 set to the full counterclockwise position.

$F_X$ = Required local oscillator crystal frequency in megacycles.

1.4 mc = Frequency change for one turn of the slug of capacitor C46.

Example: Compute the approximate number of clockwise turns required to set the slug of capacitor C46 to a crystal frequency of 115.00 mc:

$$T = \frac{134.00 - 115.00}{1.4} = 13.5$$

**NOTE**

In subsequent step *d*, do not turn the slug of capacitor C46 more than 27 turns in a clockwise direction from the full counterclockwise position, or false tuning indications may be obtained.

d. Adjust the slug of oscillator capacitor C46 in a clockwise direction the number of turns computed in preceding step *c*.

5-35. OSCILLATOR ALIGNMENT.

a. Refer to figure 5-8, and observe the socket for crystal Y1 through the access hole in rear of chassis. If a crystal is installed in the socket, proceed as follows: Cover the jaws of a pair of long-nose pliers with plastic tape, grasp crystal Y1 with the pliers, and pull the crystal from the socket to the point where the crystal is stopped against the crystal mounting clip. Twist the crystal approximately 45 degrees to free it from the mounting clip, and withdraw the crystal from the access hole.

b. Fabricate a dummy crystal as shown in figure 5-10.

c. Use the long-nose pliers, and insert the dummy crystal into the socket for crystal Y1.

d. Adjust the signal generator for a 5-millivolt output

signal, modulated 30 percent at 1000 cps.

e. Set the AUDIO GAIN control on the front panel of the receiver to position 4. The POWER and CARRIER indicator lamps on the front panel should be illuminated.

f. Refer to figure 5-8, and adjust capacitor C46 *slowly* until the 1000-cps audio signal is heard in the headset.

g. If the 1000-cps audio signal in preceding step *f* cannot be discerned with a 5-millivolt output signal, adjust the slug of capacitor C46 to the full counterclockwise position, and increase the output of the signal generator to 50 millivolts. Turn the slug of capacitor C46 to the setting computed in step *c* of preceding paragraph 5-34, and *carefully* readjust the slug to the point where the 1000-cps signal just becomes audible.

h. Remove the dummy crystal installed in preceding step *c*.

i. A crystal of the frequency computed in step *b* of preceding paragraph 5-34 must be installed in the socket for crystal Y1. Grasp the crystal with the long-nose pliers so that the flat sides of the crystal are parallel with the bottom of the receiver chassis and the crystal pins are facing the access hole in rear of chassis. Insert the crystal through the access hole *above* the mounting clip, and start the crystal pins into the socket. Press the crystal down into the clip, and continue pressing the crystal forward until the pins are securely engaged in the socket.

j. *Carefully* adjust the frequency of the signal generator until a signal is heard in the headset.

k. Remove crystal Y1 as described in preceding step *a*, and install the dummy crystal in the crystal socket.

**NOTE**

Before performing subsequent step *m*, make sure that the top and bottom equipment covers are secured in place on the receiver chassis.

l. If a signal is heard in the headset, proceed to subsequent step *m*. If no signal is heard, adjust capacitor C46 *slowly* until the signal is audible.

m. Remove the dummy crystal, and install crystal Y1 as described in preceding step *i*. The signal should be audible in the headset.

5-36. RF ALIGNMENT.

a. Set the AUDIO GAIN control on the front panel of the receiver to position 1.

b. Set the SQUELCH switch on the front panel of the receiver to the ON/MUTING position. Set the signal generator for 30 percent modulation at 1000 cps, and increase the output attenuator level of the signal generator *slowly* until the CARRIER indicator lamp on the front panel of the receiver is illuminated.

c. Adjust the AUDIO GAIN control on the front panel of the receiver for an indication of 1 watt on the power output meter.

d. Set the SQUELCH switch to the OFF position, and reduce the output attenuator level of the signal generator until an indication of approximately 0.4 watt is obtained.

e. Refer to figure 5-8, and adjust capacitors C2, C4, C11, and C16 *in sequence* for a *peak* indication on the power output meter, reducing the output of the signal generator as necessary to maintain the indication *below* 0.6 watt.

f. Set the RF GAIN control on the front panel of the receiver to position 2, and adjust the output attenuator of the signal generator for an indication of approximately 0.6 watt on the power output meter.

g. Readjust capacitors C2, C4, C11, and C16 in sequence for a peak indication on the power output meter, reducing the output of the signal generator as necessary to maintain the indication below 0.6 watt.

5-37. MIXER AND I-F ALIGNMENT.

**NOTE**

Mixer coil L6 and i-f transformers T1 and T2, figure 5-8, have been carefully adjusted at the factory for optimum performance. Readjustment is seldom required. If readjustment becomes necessary for reasons such as replacement of these parts or other associated parts, follow the procedure outlined in subsequent steps *a* through *l*.

a. Refer to figure 5-8, remove the eight mounting screws from the top equipment cover, and remove the cover.

b. Refer to figure 5-8, and detune capacitor C16 by turning the slug of the capacitor approximately three turns in a counterclockwise direction. This reduces the effects of receiver front-end noise, permitting accurate adjustment of the mixer and i-f circuits.

c. Set the AUDIO GAIN control on the front panel of the receiver to position 1.

d. Set the SQUELCH switch on the front panel of the receiver to the ON/MUTING position. Set the signal generator for 30 percent modulation at 1000 cps, and increase the output attenuator level of the signal generator *slowly* until the CARRIER indicator lamp on the front panel of the receiver is illuminated.

e. Set the AUDIO GAIN control on the receiver for an indication of 1 watt on the power output meter.

f. Set the SQUELCH switch to the OFF position, and reduce the output attenuator level of the signal generator until an indication of approximately 0.6 watt is obtained.

g. Refer to figure 5-8, and adjust the slug of coil L6 and/or transformers T1 and T2, as necessary, for a peak indication on the power output meter. Reduce the output of the signal generator during the tuning process to maintain the output indication *below* 0.6 watt.

h. Refer to figure 5-8, and readjust capacitor C16 for a peak indication on the power output meter, reducing the output of the signal generator as necessary to maintain the indication below 0.6 watt.

i. Reduce the output of the signal generator to zero, and

set the receiver SQUELCH switch to the ON/MUTING position.

j. Increase the output of the signal generator *slowly* until the CARRIER indicator lamp on the front panel of the receiver is illuminated. The output of the signal generator should be 3 microvolts or less.

k. Replace the top equipment cover on the receiver, and secure the cover in place with the eight mounting screws.

l. Return the receiver SQUELCH switch to the OFF position.

5-38. ADJUSTMENT OF MUTING CONTROL.

**NOTE**

Muting control R36, figure 5-8, is included in the receiver to provide a means of establishing the audio output level when the receiver is operating below the squelch threshold. Effective range of the control is from —6 to —30 db, with maximum signal attenuation occurring in the full counterclockwise position. To adjust control R36, follow the procedure outlined in subsequent steps *a* through *i*.

a. Refer to figure 5-8, remove the eight mounting screws from the top equipment cover, and remove the cover.

b. Set the RF GAIN control on the front panel of the receiver to position 1.

c. Set the AUDIO GAIN control on the receiver to position 4.

d. Set the SQUELCH switch on the receiver to the ON/MUTING position.

e. Refer to figure 5-8, and adjust muting control R36 to the full clockwise position.

f. Set the signal generator for 30 percent modulation at 1000 cps, and adjust the output of the signal generator until the CARRIER indicator lamp on the receiver is illuminated.

g. Decrease the output of the signal generator until the CARRIER indicator lamp is extinguished.

h. Note the receiver audio output indicated on the power output meter, and adjust control R36 in a counterclockwise direction until the desired output reduction is achieved.

i. Replace the top equipment cover on the receiver, and secure the cover in place with the eight mounting screws.

5-39. FINAL PROCEDURE.

a. Set the AUDIO GAIN control on the receiver to the PWR OFF position.

b. Disconnect all test equipment from the receiver.

# SECTION II
# SPECIAL MAINTENANCE

**5-40. GENERAL.**

5-41. Should Special Maintenance be required, the procedures of Section I shall apply.

# CHAPTER 6
# CIRCUIT DIAGRAMS

## 6-1. INTRODUCTION.

6-2. This chapter contains the block diagram and circuit diagram for Radio Receiver R-1250/GR. These diagrams are designed to give you a better understanding of the equipment and to help you in troubleshooting and maintaining the receiver.

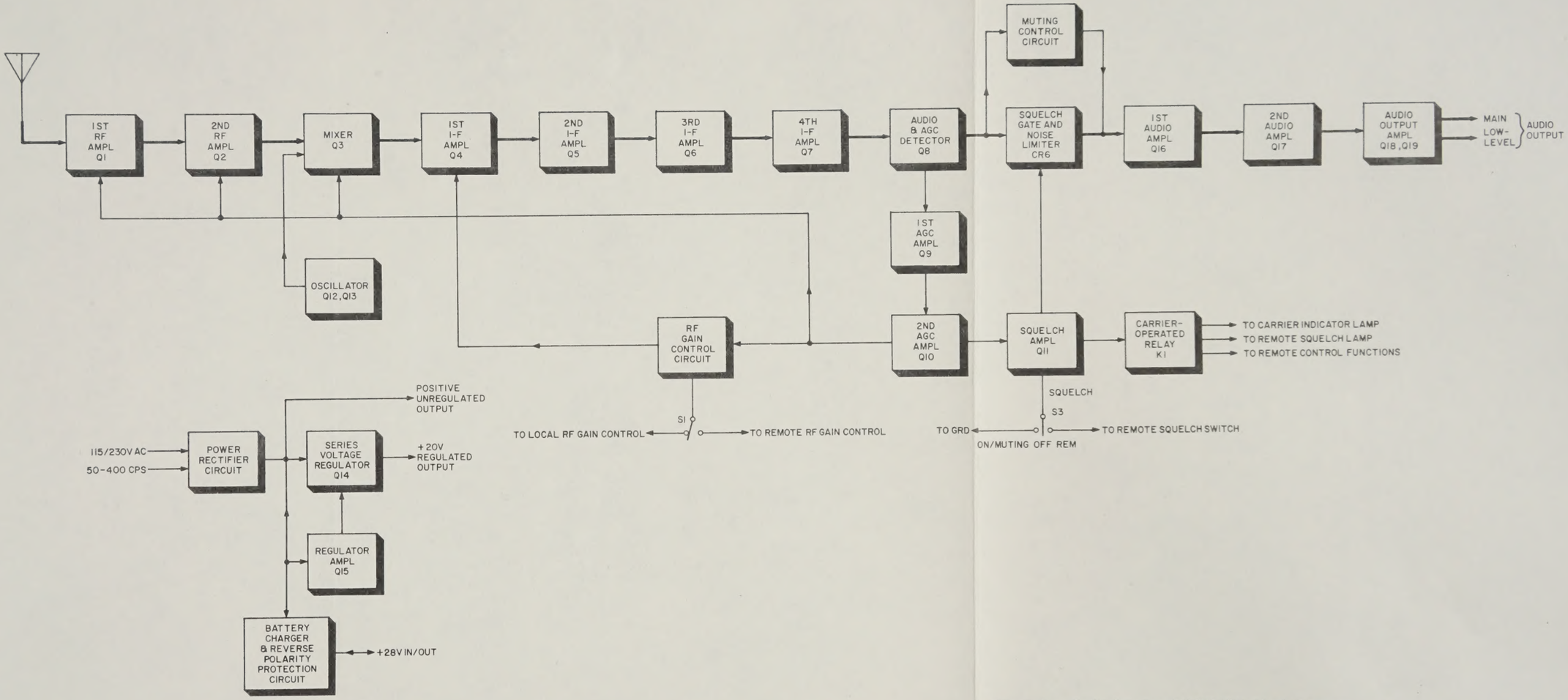



*Figure 6-1. Radio Receiver R-1250/GR, Block Diagram*

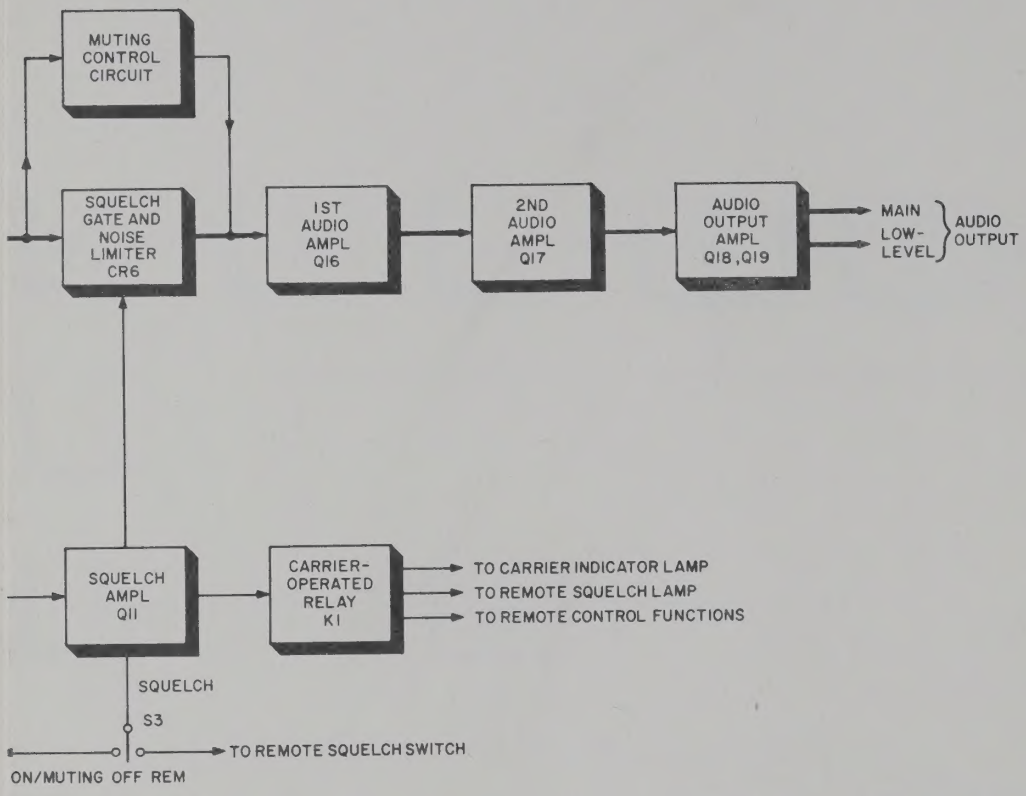
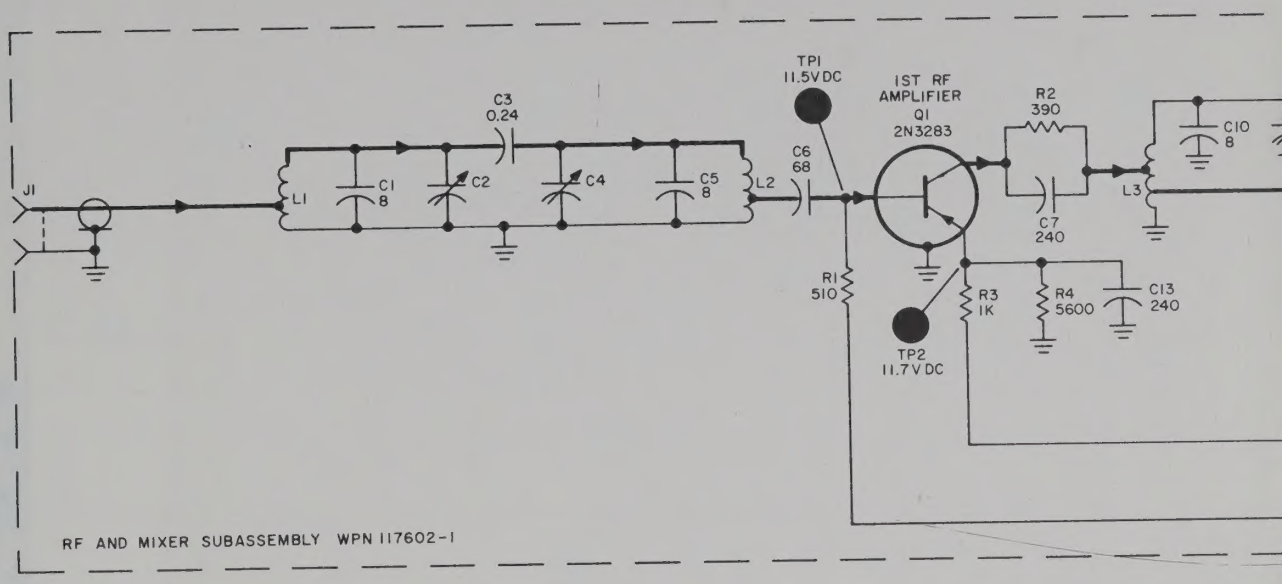
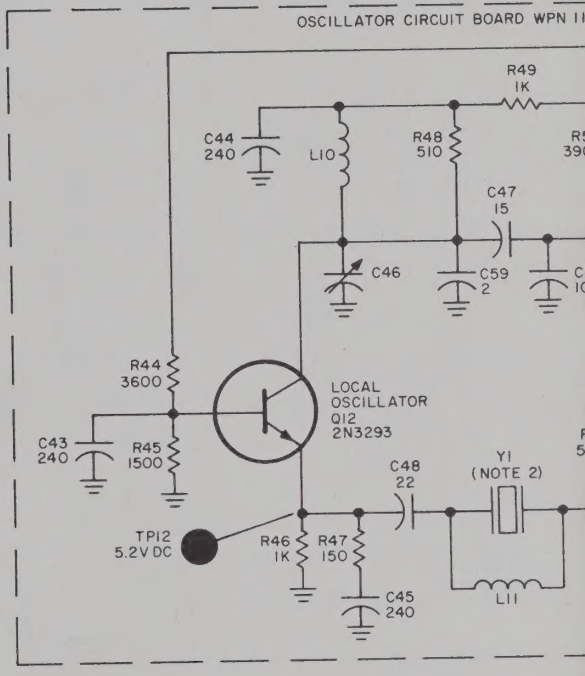



*Figure 6-1. Radio Receiver R-1250/GR, Block Diagram*


TP1
11.5VDC
1ST RF
AMPLIFIER
Q1
2N3283
R2
390
C10
8
C3
0.24
J1
L1
C1
8
C2
C4
C5
8
L2
C6
68
L3
C7
240
R1
510
R3
1K
R4
5600
C13
240
TP2
11.7VDC
RF AND MIXER SUBASSEMBLY WPN 117602-1


OSCILLATOR CIRCUIT BOARD WPN 11
R49
1K
C44
240
L10
R48
510
C47
15
C46
C59
2
R44
3600
LOCAL
OSCILLATOR
Q12
2N3293
C43
240
R45
1500
C48
22
Y1
(NOTE 2)
TP12
5.2VDC
R46
1K
R47
150
C45
240
L11

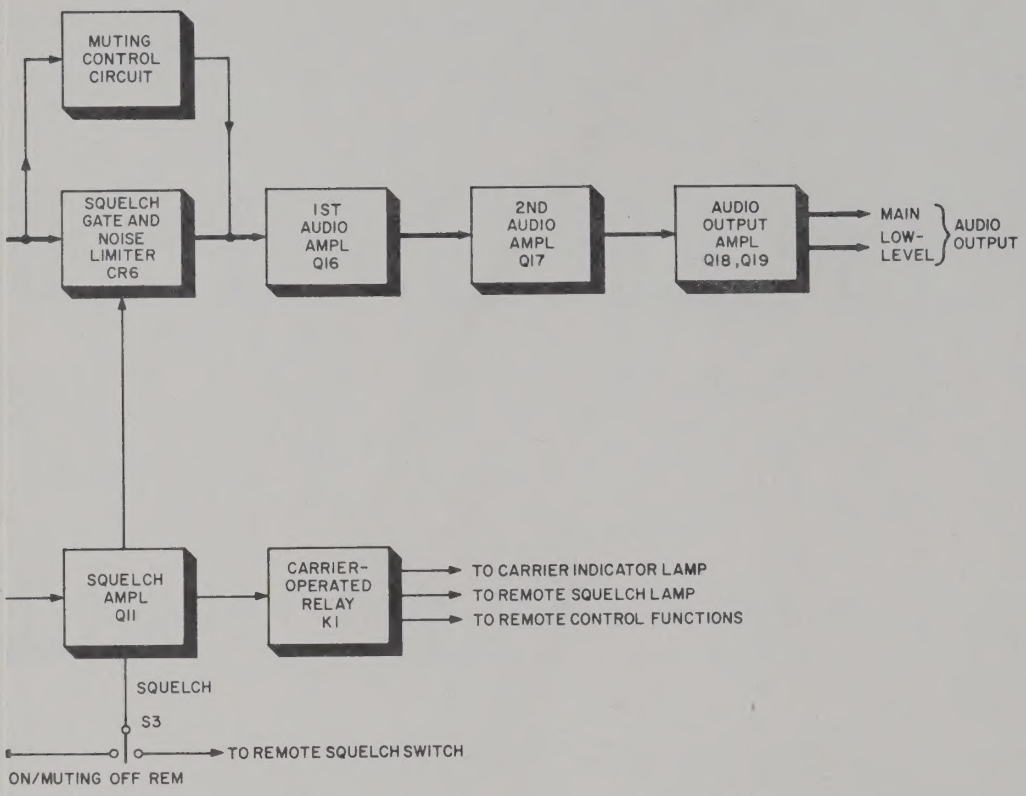



*Figure 6-1. Radio Receiver R-1250/GR, Block Diagram*

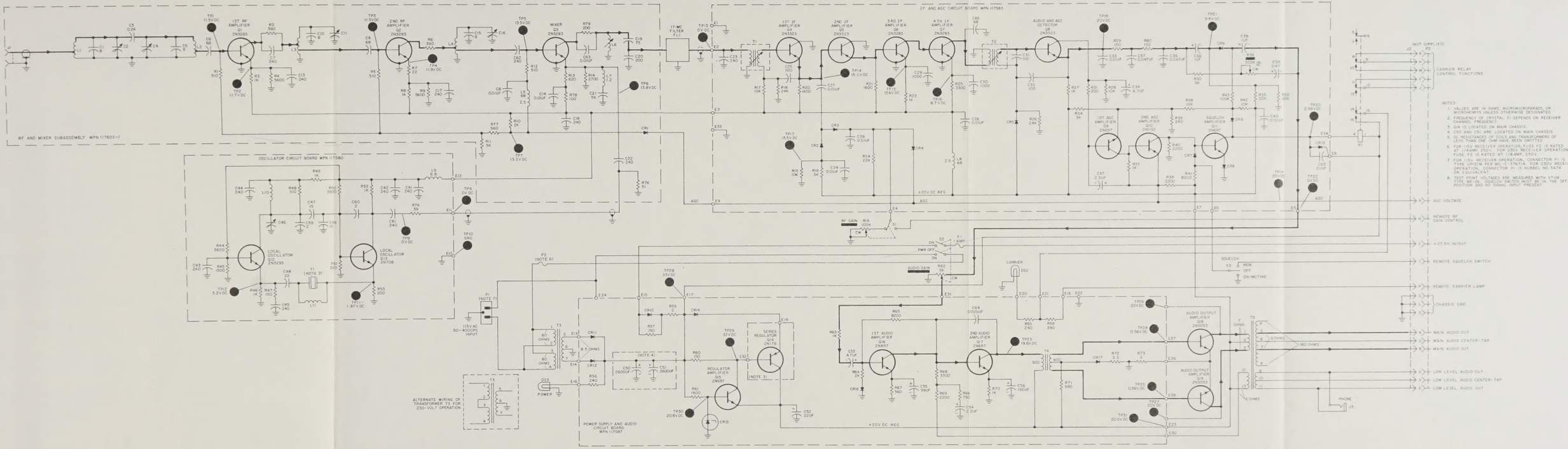
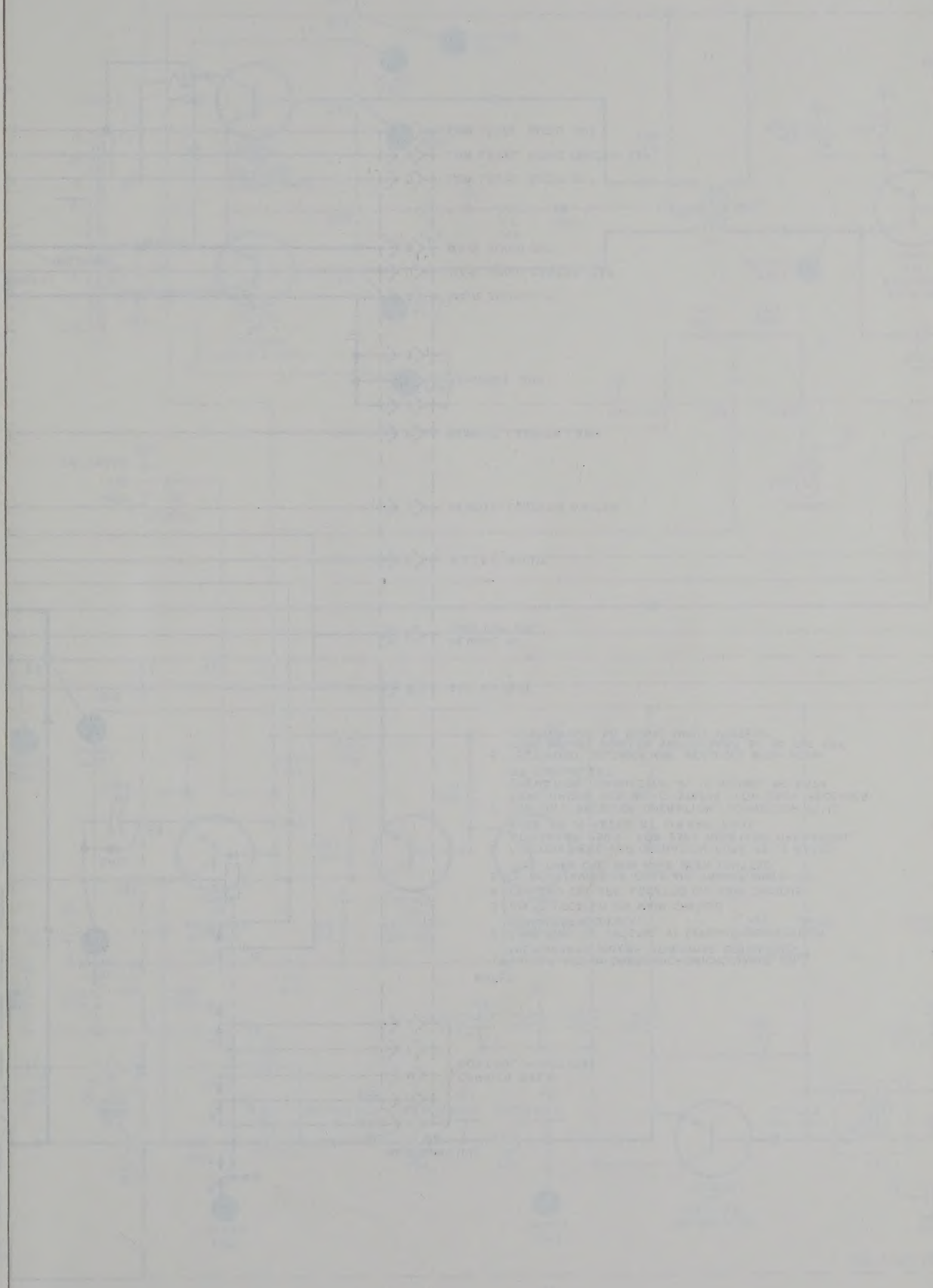

RF AND MIXER SUBASSEMBLY WPN 117602-1
OSCILLATOR CIRCUIT BOARD WPN 117580
IF AND AGC CIRCUIT BOARD WPN 117583
POWER SUPPLY AND AUDIO CIRCUIT BOARD WPN 117597
1ST RF AMPLIFIER Q1 2N3293
2ND RF AMPLIFIER Q2 2N3293
MIXER Q3 2N3293
LOCAL OSCILLATOR Q12 2N3293
LOCAL OSCILLATOR Q13 2N708
1ST IF AMPLIFIER Q4 2N3323
2ND IF AMPLIFIER Q5 2N3323
3RD IF AMPLIFIER Q6 2N3283
4TH IF AMPLIFIER Q7 2N3283
AUDIO AND AGC DETECTOR Q8 2N3323
1ST AGC AMPLIFIER Q9 2N697
2ND AGC AMPLIFIER Q10 2N1132
SQUELCH AMPLIFIER Q11 2N697
1ST AUDIO AMPLIFIER Q16 2N697
2ND AUDIO AMPLIFIER Q17 2N697
AUDIO OUTPUT AMPLIFIER Q18 2N3053
AUDIO OUTPUT AMPLIFIER Q19 2N3053
REGULATOR AMPLIFIER Q15 2N697
SERIES REGULATOR Q14 2N176
17-MC FILTER FL1
RF GAIN R9 100K
AUDIO GAIN R62 5K
PWR OFF ON
SQUELCH S3 REM OFF ON/MUTING
CARRIER
115V AC 50-400CPS INPUT
ALTERNATE WIRING OF TRANSFORMER T3 FOR 230-VOLT OPERATION
+20V DC REG
AGC
(NOT SUPPLIED) P2
CARRIER RELAY CONTROL FUNCTIONS
AGC VOLTAGE
REMOTE RF GAIN CONTROL
+27.5V IN/OUT
REMOTE SQUELCH SWITCH
REMOTE CARRIER LAMP
CHASSIS GRD
MAIN AUDIO OUT
MAIN AUDIO CENTER-TAP
MAIN AUDIO OUT
LOW LEVEL AUDIO OUT
LOW LEVEL AUDIO CENTER-TAP
LOW LEVEL AUDIO OUT
PHONE J3
NOTES:
1. VALUES ARE IN OHMS, MICROMICROFARADS, OR MICROMFDS UNLESS OTHERWISE DESIGNATED.
2. FREQUENCY OF CRYSTAL Y1 DEPENDS ON RECEIVER CHANNEL FREQUENCY.
3. Q14 IS LOCATED ON MAIN CHASSIS.
4. C50 AND C51 ARE LOCATED ON MAIN CHASSIS.
5. DC RESISTANCES OF COILS AND TRANSFORMERS OF LESS THAN ONE OHM HAVE BEEN OMITTED.
6. FOR 115V RECEIVER OPERATION, FUSE F2 IS RATED AT 1/4AMP, 250V. FOR 230V RECEIVER OPERATION, FUSE F2 IS RATED AT 1/8AMP, 250V.
7. FOR 115V RECEIVER OPERATION, CONNECTOR P1 IS TYPE UP02W PER MIL-C-3767/4. FOR 230V RECEIVER OPERATION, CONNECTOR P1 IS HUBBELL NO. 5674 OR EQUIVALENT.
8. TEST POINT VOLTAGES ARE MEASURED WITH VTVM TYPE ME-26. SQUELCH SWITCH MUST BE IN THE OFF POSITION AND NO SIGNAL INPUT PRESENT.

*Figure 6-2. Radio Receiver R-1250/GR, Schematic Diagram*



# CHAPTER 7
# ILLUSTRATED PARTS BREAKDOWN

## SECTION I
## INTRODUCTION

### 7-1. GENERAL.

7-2. This chapter contains the Illustrated Parts Breakdown which lists and illustrates all replaceable assemblies and parts in Radio Receiver R-1250/GR. The chapter is divided into four sections as follows:

a. Section I, Introduction. This sections contains the instructions you will need to use correctly the information contained in Sections II, III, and IV.

b. Section II, Numerical Index. This section is a complete alphabetical-numerical index of all parts listed in Section IV, and provides a cross reference to the figure and index number which illustrates and identifies each part.

c. Section III, Reference Designation Index. This section lists all electronic parts by their reference designations, arranged in standard alphabetical numerical order. The Reference Designation Index provides a cross reference to the part numbers and the figure-index numbers in Sections II and IV.

d. Section IV, Group Assembly Parts List. All replaceable parts and assemblies required for maintenance are illustrated, listed, and identified in this section.

### 7-3. EXPLANATION OF SECTION II—NUMERICAL INDEX.

7-4. GENERAL. The Numerical Index is compiled in accordance with the alpha-numerical filing system described below.

a. Part number alphabetical-numerical arrangement begins in the left-hand position and continues from left to right, one position at a time, until all part numbers are arranged in sequence.

b. Order of precedence in the first column (left-hand position) is letters A through Z and then numerals 0 through 9 (alphabetical "O's" are considered to be numerical zeros).

c. The order of precedence in continuing the part number arrangement in the second and succeeding positions of the part number from left to right is as follows:

Space (blank column)
Diagonal (slant) /
Point (period) .
Dash —
Letters A through Z
Numerals 0 through 9

7-5. MFR. PART NUMBER COLUMN. This column lists the part numbers for all items which have been assigned a part number in the Group Assembly Parts List. Commercial (COML) items, which do not require part numbers, are listed alphabetically by their identifying noun name.

7-6. FEDERAL STOCK NUMBER COLUMN. The federal stock number column has been deleted since the policy of including and updating stock number information in technical manuals has been discontinued. See S-00-1-1, USAF Master Cross Reference Index, for converted part number to stock number information.

7-7. FIG. AND INDEX NO. COLUMN. In this column, the digits preceding the dash refer to the figure in the Illustrated Parts Breakdown on which the parts or assemblies are illustrated. The digits following the dash are the index numbers assigned to the parts or assemblies on that particular figure.

7-8. QTY. PER ART. COLUMN. This column lists the total quantity of parts or assemblies required for the complete radio receiver. If the total quantity of a part or assembly is not the same for each receiver (as reflected in the usable on code column in the Group Assembly Parts List), the largest quantity for any one receiver is shown.

7-9. SOURCE CODE AND REPAIR CODE COLUMNS. The source code column lists all of the source codes assigned to parts or assemblies in the radio receiver. The repair code column lists all of the maintenance repair level codes assigned to parts or assemblies in the radio receiver. Policies, general information, and procedures for changing source and maintenance coding are contained in T.O. 00-25-195. Generally, the source codes, and maintenance repair level codes, herein (see Source Code and Repair Code Columns) were assigned by Air Force personnel when this equipment was purchased. Assignment of codes was influenced by (a) maintenance policies of the Air Force base self-sufficiency program, (b) predicted maintenance actions, (c) base facilities and capabilities, (d) economic considerations. Definition of these codes follow:

a. Source Code Definitions—For Non-Kitted Items.

(1) Code M is applied to parts which are within the capabilities of any activity to manufacture. Procurement is not justified in view of relative low usage or storage and installation factors of these parts. Needs are to be met by local manufacture as required.

(2) Code M1 is applied to parts which can be manufactured only by utilizing the capabilities of the depot. Procurement and stocking of these parts is not justified in view of their relative low usage and installation factors.

(3) Code P1 identifies parts which may be requisitioned and installed by any maintenance level consistent with the Command's authorized scope of maintenance. The code applies to parts which are impractical to service manufacture.

(4) Code P2 identifies insurance-type parts which can be installed by any Air Force Activity consistent with the Command's authorized scope of maintenance. This code is applied to such parts which are basically structural and for which no usage is anticipated or known; require special tools, templates, and/or jigs; and are very difficult, impractical, or uneconomical to manufacture by Air Force activities. These items are not subject to periodic replacement or wear-out but may require infrequent replacement as a result of accidents or other unexpected occurrences. Delayed procurement items, as defined in AFLCM400-1, are included under this code.

(5) Code U is applied to installation drawings, diagrams, instruction sheets, field service drawing numbers, and parts not otherwise of supply significance, including obsolete parts which cannot be procured or service manufactured.

(6) Code X2 identifies parts applicable at any level of maintenance consistent with the Command's authorized scope of maintenance, usage of which is not anticipated; and which are impracticable for service manufacture. This type of item will not be stocked. Such parts shall be obtained from reclamation or requisitioned through normal supply channels with supporting justification for one time procurement and immediate issue.

b. Repair Code Definitions.

(1) Code D identifies items on which a limited degree of repair can be accomplished by field level maintenance activities. Normal servicing will be done at organizational level. SRA is established for overhaul of these items. A range of repair parts, tools, and technical order data consistent with the capability of repair are procured and provided to applicable field maintenance activities. Because of the design characteristics and complexity of repair, the degree of repair which is authorized on these items at field level maintenance is necessarily determined by the degree of technical skills required and the cost of special tools, special test equipment, spare parts, and the predicted frequency of failure generation. If these items cannot be returned to serviceable condition with authorized parts and tools, they will be returned to supply for shipment to the designated SRA.

(2) Code DM identifies items to which all the conditions of Code D apply [see preceding para (1)] except that repair beyond field capability will be done by the Mobile Depot Activity (MDA). If the MDA cannot repair these items they will determine whether these items should be condemned or sent to the SRA.

(3) Code S identifies items which are nonrepairable and have no reclamation value. When these items fail, they will be disposed of at user level as condemned material.

7-10. EQUIP. SPARES LEVEL COLUMN. This column contains approved spare quantities on certain items as recommended by the contractor at the time of the provisioning conference.

## 7-11. EXPLANATION OF SECTION III— REFERENCE DESIGNATION INDEX.

7-12. GENERAL. The Reference Designation Index lists the reference designation symbols which have been established for all electronic parts of the radio receiver.

7-13. REFERENCE DESIGNATION COLUMN. The reference designation symbols for the radio receiver are arranged in this column in standard alphabetical-numerical sequence. The column contains all reference designation symbols shown on schematic diagrams and other supporting material contained in the preceding chapters of this manual.

7-14. FIG. AND INDEX NO. COLUMN. This column contains the Group Assembly Parts List figure and index numbers assigned to reference designation items.

7-15. FEDERAL STOCK NUMBER COLUMN. The federal stock number column has been deleted since the policy of including and updating stock number information in technical manuals has been discontinued. See S-00-1-1, USAF Master Cross Reference Index, for converted part number to stock number information.

7-16. MFR PART NUMBER COLUMN. The part numbers of those parts which have been assigned reference designation symbols are listed in this column.

## 7-17. EXPLANATION OF SECTION IV— GROUP ASSEMBLY PARTS LIST.

7-18. GENERAL. The Group Assembly Parts List contains a breakdown of all of the replaceable parts of the radio receiver. The breakdown of the receiver is listed in order of disassembly, beginning with the complete receiver, followed by assemblies, and finally, listing detailed subassemblies and parts.

7-19. Each assembly (subassembly) is listed in order of disassembly and is followed immediately by its component parts, properly indented to show their relationship to the assembly (subassembly) and to the over-all radio receiver. Attaching parts are listed immediately following the item which they attach and have the same indention. Items which are made from raw stock, such as cut lengths of wire, solder, lacing cord, and flexible tubing, are not included in the Group Assembly Parts List. An example of the

breakdown, indicated by indenture, is as follows:

```
1 2 3 4 5 6 7 8 9
MAIN ASSEMBLY
. ASSEMBLY
    ATTACHING PARTS
. SCREW
. NUT
    - - - * - - -
. . COMPONENT PART
. . SUBASSEMBLY
. . . COMPONENT PART
. . . SUB-SUBASSEMBLY
```

7-20. FIG. AND INDEX NO. COLUMN. In this column, the digits preceding the dash refer to the figure in the Group Assembly Parts List on which the parts or assemblies are illustrated. The digits following the dash are the index numbers assigned to the parts or assemblies on that particular figure.

7-21. MFR PART NUMBER COLUMN. This column lists one of the following:

a. A Wilcox Electric Company part number for an item manufactured by, or altered by, Wilcox Electric Company.

b. A part number of a commercially manufactured item.

c. A Government Standard part number such as AN or MS.

d. Commercial hardware items available from normal commercial sources and having no definitive part numbers are listed as COML. Complete identification is provided in the DESCRIPTION column.

e. The part number of the spare parts package available for radio receiver is listed as the last number in the Group Assembly Parts List for the main assembly of the receiver (figure 1).

7-22. WILCOX ELECTRIC COMPANY PART NUMBERING SYSTEM.

a. Drawing numbers and part numbers are identical.

b. Parts manufactured by the Wilcox Electric Company are assigned a basic five-digit number which may have a dash number suffix to designate similar parts or left- and right-hand parts, etc. For example: 46177-1.

c. Parts that are purchased by Wilcox Electric Company, then altered or selected for special fits etc., are also assigned Wilcox part numbers as noted in preceding step *b*.

d. Subassemblies are assigned part numbers in the 117,000 series. Major assemblies, component, and systems are usually assigned a 97,000 number in addition to the model or series number (for example: Radio Receiver R-1250/GR, Type 97717-100).

7-23. DESCRIPTION COLUMN. This column lists all replaceable parts of the radio receiver in order of disassembly (see para 7-18 and 7-19) by item names assigned as follows:

a. Approved Federal Item Identification Name obtained from Cataloging Handbook H6-1.

b. Item name assigned to part on Wilcox Electric Company drawing.

7-24. MFR CODE COLUMN. If a part is purchased from a vendor other than Wilcox Electric Company, a Federal Manufacturer Code Number from Cataloging Handbook H4-1 has been assigned to the vendor. The Federal Manufacturer Code Number appears in this column. The vendor's name and address is indicated in paragraph 7-27.

7-25. UNITS PER ASSY COLUMN. Quantities specified in this column are the total number of each part required per assembly or subassembly and are not necessarily the total number used in the radio receiver. Refer to the Numerical Index, Section II, for the total quantities used per equipment. The letter AR denotes that a selection of a part or parts should be made as required. REF refers to an assembly which is completely assembled on preceding illustration, and is now exploded on the illustration on which it is referenced. In this case, the description has a notation which refers to the illustration on which the assembly is shown completely assembled and indexed.

7-26. USE ON CODE COLUMN. Part variations between radio receivers are indicated by a letter symbol immediately following the units per assembly in the USE ON CODE COLUMN. In cases where the column has been left blank, parts listed apply to all radio receivers covered by this manual. No usable on codes have been assigned to the radio receiver as of the publication date of this manual.

## 7-27. VENDOR'S CODE, NAME, AND ADDRESS.

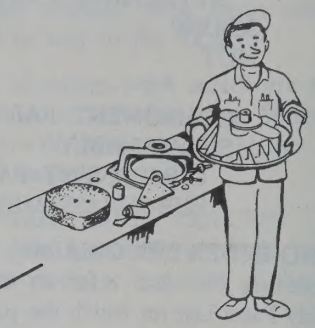
7-28. The following list includes the vendor code, name, and address of suppliers for purchased and vendor parts.

| MFR CODE | NAME AND ADDRESS |
|---|---|
| 00136 | McCoy Electronics Co.<br>Mt Holy Springs, Pennsylvania |
| 04264 | Circon Components Company<br>Goleta, California |
| 06776 | Nugent Electronics Company<br>New Albany, Indiana |
| 07388 | Torotel, Incorporated<br>Kansas City, Missouri |
| 11711 | General Instrument Corporation,<br>Semiconductor Division<br>Newark, New Jersey |
| 12014 | Chicago Rivet and Machine Co.<br>Bellwood, Illinois |
| 12697 | Clarostat Mfg. Co., Inc.<br>Dover, New Hampshire |
| 13103 | Thermalloy Co.<br>Dallas, Texas |
| 14433 | ITT Components Division of<br>International Telephone and Telegraph<br>Corporation<br>Palo Alto, California |

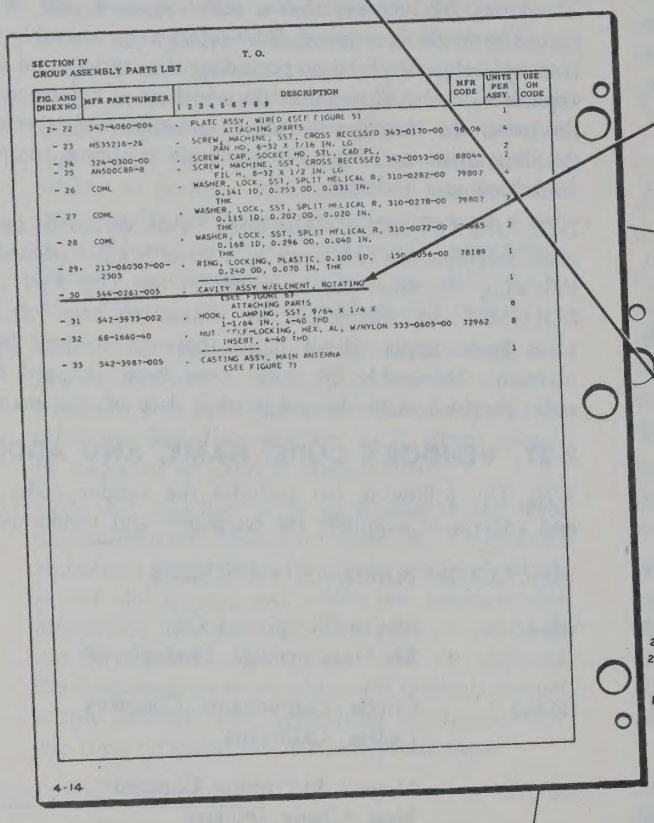
# HOW TO USE THIS ILLUSTRATED PARTS BREAKDOWN

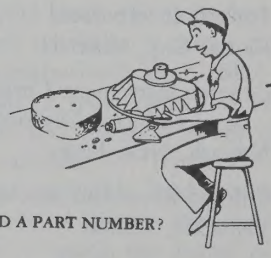
SHEET 1 OF 2

HOW TO ASSEMBLE?



HOW TO FIND THE DESCRIPTION?


SECTION IV
GROUP ASSEMBLY PARTS LIST
T. O.
FIG. AND INDEX NO.
MFR PART NUMBER
DESCRIPTION
MFR CODE
UNITS PER ASSY
USE ON CODE
2- 22 542-4060-004 . PLATE ASSY, WIRED (SEE FIGURE 5)
ATTACHING PARTS
- 23 MS35216-26 . SCREW, MACHINE, SST, CROSS RECESSED PAN HD, 6-32 X 7/16 IN. LG
- 24 324-0300-00 . SCREW, CAP, SOCKET HD, STL, CAD PL,
- 25 AN500C8R-8 . SCREW, MACHINE, SST, CROSS RECESSED FIL H, 8-32 X 1/2 IN. LG
- 26 COML . WASHER, LOCK, SST, SPLIT HELICAL R, 0.141 ID, 0.253 OD, 0.031 IN. THK
- 27 COML . WASHER, LOCK, SST, SPLIT HELICAL R, 0.115 ID, 0.202 OD, 0.020 IN. THK
- 28 COML . WASHER, LOCK, SST, SPLIT HELICAL R, 0.168 ID, 0.296 OD, 0.040 IN. THK
- 29 213-060307-00-2303 . RING, LOCKING, PLASTIC, 0.100 ID, 0.240 OD, 0.070 IN. THK
- 30 544-0261-005 . CAVITY ASSY W/ELEMENT, ROTATING (SEE FIGURE 6)
ATTACHING PARTS
- 31 542-3973-002 . HOOK, CLAMPING, SST, 9/64 X 1/4 X 1-1/64 IN., 4-40 THD
- 32 68-1660-40 . NUT, PLF-LOCKING, HEX, AL, W/NYLON INSERT, 4-40 THD
- 33 542-3987-005 . CASTING ASSY, MAIN ANTENNA (SEE FIGURE 7)
78189
72962
4-14
T. O.
SECTION IV
GROUP ASSEMBLY PARTS LIST
4-11



HOW TO FIND A PART NUMBER?

HOW TO FIND THE PART NUMBER IF THE SECTION OR SYSTEM OF THE EQUIPMENT IN WHICH THE PART IS USED IS KNOWN:

(1) Turn to the Table of Contents and find the page number for the Major Assembly or System in which the part is used.

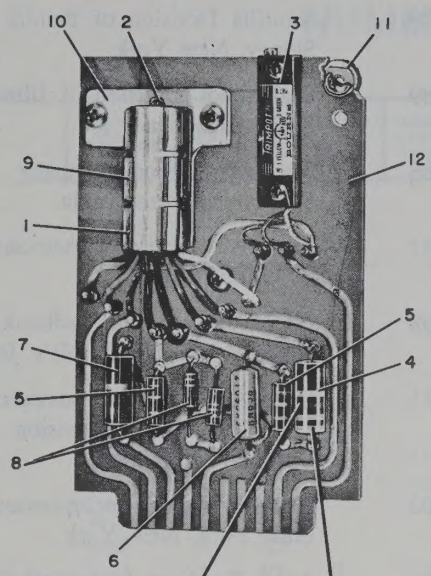
(2) Turn to the page determined in step (1).

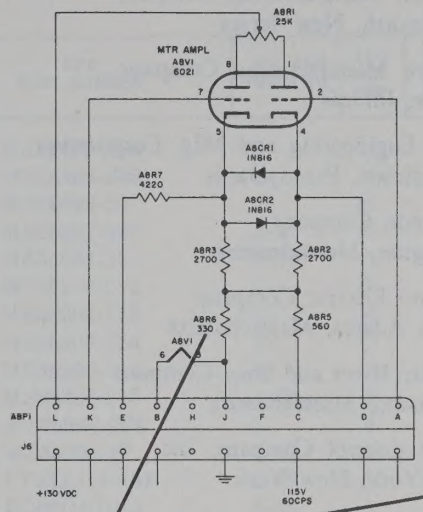
(3) Locate the part and its index number on the illustration.

(4) Find the index number on the Group Assembly Parts List page to determine complete description.

# HOW TO USE THIS ILLUSTRATED PARTS BREAKDOWN

**SHEET 2 OF 2**




**SECTION II**
**NUMERICAL INDEX**

| MFR PART NUMBER | FEDERAL STOCK NUMBER | FIG. AND INDEX NO. | Q'P'A |
|---|---|---|---|
| RC32GF223K | 5905-299-2019 | 24- 92 | |
| RC32GF271K | 5905-101-9957 | 32- 38 | |
| RC32GF274K | 5905-279-3837 | 81- 31 | |
| RC32GF331K | 5905-279-2645 | 23- 4 | |
| RC32GF333K | 5905-279-1716 | 24-106 | |
| RC32GF392K | 5905-299-2039 | 71- 52 | |
| RC32GF393K | 5905-299-2016 | 24-109 | |
| RC32GF471K | 5905-617-7226 | 66- | |
| RC32GF473K | 5905-114-2714 | 24-10 | |
| RC32GF561K | 5905-299-2049 | 23- | |
| RC32GF562K | 5905-537-6462 | 70- | |
| RC32GF682K | 5905-299-2036 | 24-1 | |
| RC32GF822K | 5905-279-1718 | 24- | |
| RC42GF100K | | 83- | |
| RC42GF101K | 5905-279-1979 | 7- | |
| RC42GF103K | 5905-185-8516 | 92 | |
| RC42GF104K | 5905-171-1978 | 7 | |
| RC42GF123K | 5905-192-0626 | 1 | |
| RC42GF153K | 5905-249-4217 | | |
| RC42GF222K | 5905-171-1974 | | |
| RC42GF271K | 5905-185-6966 | | |
| RC42GF274K | 5905-279-1921 | | |
| RC42GF332K | 5905-195-6748 | | |
| RC42GF333K | 5905-192-3979 | | |

| FEDERAL STOCK NUMBER | FIG. AND INDEX NO. | QTY PER ART. | SMR CODE | EQUIP SP ARES LEVEL |
|---|---|---|---|---|
| | 5- 10 | AR | P1 | |
| | 5- 10 | AR | P1 | |
| | 5- 11 | AR | P1 | |

**SECTION III**
**REFERENCE DESIGNATION**

| REFERENCE DESIGNATION | FIG. AND INDEX NO. | FEDERAL STOCK NUMBER | MFR PART NUMBER |
|---|---|---|---|
| A7T1 | 22- 28 | 5950-615-5029 | X-065 |
| A7T2 | 22- 27 | 5950-651-5323 | X-077 |
| A8CR1 | 23- 8 | | 1N816 |
| A8CR2 | 23- 8 | | 1N816 |
| A8P1 | 23- 12 | | 546-7884-004 |
| A8R1 | 23- 3 | | 224L-1-203 |
| A8R2 | 23- 6 | 5905-537-6437 | RC20GF272K |
| A8R3 | 23- 5 | 5905-537-6437 | RC20GF272K |
| A8R5 | 23- 7 | 5905-299-2049 | RC32GF561K |
| A8R6 | 23- 4 | 5905-279-2645 | RC32GF331K |
| A8R7 | 23- 6 | 5905-542-7671 | RN65B4221F |
| A8V1 | 23- 2 | 5960-754-9773 | 6021 |
| CR1 | 24-111 | 5960-552-9852 | JAN-1N251 |
| CR2 | 24-111 | 5960-552-9852 | JAN-1N251 |
| CR3 | 24-111 | 5960-552-9852 | JAN-1N251 |
| CR4 | 24-111 | 5960-552-9852 | JAN-1N251 |
| CR5 | 24-111 | 5960-552-9852 | JAN-1N251 |
| CR6 | 24-111 | 5960-552-9852 | JAN-1N251 |
| CR7 | 24-110 | 5960-284-6516 | JAN-1N251 |
| C10 | 24- 89 | 5910-678-5306 | 1N198 |
| C11 | 29- 2 | | 841010X5G01032 |
| | | | 22H50162 |

| REFERENCE DESIGNATION | FIG. AND INDEX NO. |
|---|---|
| 3A3R10 | 24-104 |
| 3A3R11 | 24-105 |
| 3A3R13 | 24- 92 |
| 3A3R14 | 24-109 |
| 3A3R15 | 24-107 |
| 3A3R16 | 24- 94 |
| 3A3R17 | 24- 94 |
| 3A3R18 | 24-107 |
| 3A3R19 | 24- 98 |
| 3A3R2 | 24-101 |
| 3A3R20 | 24- 96 |
| 3A3R21 | 24- 95 |
| 3A3R22 | 24- 97 |
| 3A3R23 | 24-106 |
| 3A3R28 | 25- 8 |
| 3A3R29 | 24-102 |
| 3A3R29 | 24-102 |
| 3A3R3 | 24-108 |
| 3A3R31 | 24-104 |
| 3A3R32 | 24- 93 |

HOW TO FIND THE ILLUSTRATION FOR A PART WHEN THE PART NUMBER OR REFERENCE DESIGNATION IS KNOWN:

(1) When the part number is known, refer to Section II, Numerical Index, and find the part number. Note the figure and index number assigned to the part number.

(2) Turn to Section IV, Group Assembly Parts List, find the figure indicated in the numerical index, and locate the referenced index number.

(3) When the reference designation is known, refer to Section III, Reference Designation Index, and locate the reference designation symbol. Note the figure and index number assigned to the part.

(4) Turn to Section IV, find the figure indicated in the reference designation index, and locate the referenced index number.

| MFR CODE | NAME AND ADDRESS |
|---|---|
| 14871 | National Vulcanized Fiber Company<br>Los Angeles Division<br>Los Angeles, California |
| 28520 | Heyman Manufacturing Company<br>Kenilworth, New Jersey |
| 44655 | Ohmite Manufacturing Company<br>Skokie, Illinois |
| 46384 | Penn Engineering and Mfg. Corporation<br>Doylestown, Pennsylvania |
| 49956 | Raytheon Company<br>Lexington, Massachusetts |
| 56289 | Sprague Electric Company<br>North Adams, Massachusetts |
| 61007 | Tubular Rivet and Steel Company<br>Wollaston, Massachusetts |
| 70309 | Allied Control Company, Inc.<br>New York, New York |
| 71279 | Cambridge Thermionic Corporation<br>Cambridge, Massachusetts |
| 71400 | Bussmann Mfg. Division of<br>McGraw-Edison Company<br>St. Louis, Missouri |
| 72136 | Electro Motive Manufacturing Company<br>Willimantic, Connecticut |
| 72619 | Dialight Corporation<br>Brooklyn, New York |
| 72653 | GC Electronics Manufacturing Co.<br>Rockford, Illinois |
| 72962 | Elastic Stop Nut Corporation of America<br>Union, New Jersey |
| 72982 | Erie Resistor Corporation<br>Erie, Pennsylvania |
| 73899 | J.F D. Electronics Corporation<br>Brooklyn, New York |
| 75915 | Littlefuse, Incorporated<br>Des Plaines, Illinois |
| 76530 | Monadnock Mills<br>San Leandro, California |
| 77820 | Scintilla Division of Bendix Corporation<br>Sidney, New York |
| 78189 | Shakeproof Division of Illinois Tool Works<br>Elgin, Illinois |
| 78488 | Stackpole Carbon Company<br>St. Marys, Pennsylvania |
| 80131 | Electronic Industries Association<br>Washington, D. C. |
| 83298 | Bendix Corporation Redbank Division<br>Redbank Eatontown, New Jersey |
| 84411 | Good-All Electric Manufacturing Company<br>TWR Capacitor Division<br>Ogallala, Nebraska |
| 90002 | Hubbell Harvey, Incorporated<br>New York, New York |
| 91506 | Augat Brothers, Incorporated<br>Attleboro, Massachusetts |
| 94222 | South Chester Corporation<br>Chester, Pennsylvania |
| 94375 | Automatic Metal Products Company<br>Brooklyn, New York |
| 98291 | Sealectro Corporation<br>Mamaroneck, New York |
| 99800 | Delevan Electronics Corporation<br>East Aurora, New York |

**NOTE**

This list does not include the vendor code number (65597) for Wilcox Electric Company. This code number will not appear in the Group Assembly Parts List, Section IV.

## 7-29. SEPARATE ILLUSTRATED PARTS BREAKDOWN.

7-30. There are no separate illustrated parts breakdowns associated with the radio receiver.

# SECTION II
# NUMERICAL INDEX

| MFR PART NUMBER | FIG. AND INDEX NO. | QTY PER ART | SOURCE CODE | REPAIR CODE | EQUIP SPARES LEVEL |
|---|---|---|---|---|---|
| AN340-4 | 1-32 | 37 | | | |
| | 1-50 | | | | |
| AN340-6 | 1- | 18 | | | |
| AN935-4 | 1- | 50 | | | |
| | 1-30 | | | | |
| | 1-49 | | | | |
| AN935-6 | 1- | 18 | | | |
| AN935-616L | 1- | 2 | | | |
| AN935B2 | 1- | 2 | | | |
| AN935B4 | 1- | 2 | | | |
| AN935B8 | 1- | 4 | | | |
| AN960-4 | 1-29 | 15 | | | |
| CE63F | 3-45 | 3 | X2 | | |
| CM33303 | 1-11 | 1 | P1 | S | |
| CM33304 | 1-10 | 1 | P1 | S | |
| DM10C020D0100 WV1CR | 4-5 | 2 | P1 | S | |
| DM10C080D0100 WV1CR | 5-2 | 4 | P1 | S | |
| DM10C111J0100 WV4CR | 3-1 | 1 | P1 | S | |
| DM10C220J0100 WV1CR | 4-2 | 1 | P1 | S | |
| DM10C560JP100 WV4CR | 5-6 | 1 | P1 | S | |
| DM10C680J0100 WV4CR | 5-3 | 2 | P1 | S | |
| DM10C680K0100 WV4CR | 3-41 | 1 | P1 | S | |
| DM10E750K0100 WV4CR | 5-5 | 1 | P1 | S | |
| DM10F101J0100 WV1CR | 3-3 | 2 | P1 | S | |
| DM10F201K0100 WV4CR | 5-7 | 1 | P1 | S | |
| DM10F241J0100 WV1CR | 3-4 | 12 | P1 | S | |
| | 4-1 | | | | |
| | 5-4 | | | | |
| DM15F102J0100 WV1CR | 3-2 | 2 | P1 | S | |
| FHS-440-4 | 1-52 | 2 | P1 | S | |
| FP504M | 3-26 | 1 | P2 | S | |
| FT-SM-1L2 | 5-31 | 7 | P1 | S | |
| F02GR125A | 1-12 | 1 | | | 5 |
| F02GR250A | 1-14 | | | | 5 |
| F02G1R00B | 1-13 | 1 | | | 5 |
| GAO-24PFPORM 5PCT | 5-1 | 1 | P1 | S | |
| G100G | 2-24 | 2 | P1 | S | 1 |
| HKP | 1-15 | 2 | P1 | S | |
| JJ-089 | 1-4 | 1 | | | |
| LB019 | 2-25 | 1 | P1 | S | |

| MFR PART NUMBER | FIG. AND INDEX NO. | QTY PER ART | SOURCE CODE | REPAIR CODE | EQUIP SPARES LEVEL |
|---|---|---|---|---|---|
| MS24693-S26 | 1- | 4 | | | |
| MS24693-S28 | 1- | 4 | | | |
| MS24693-S3 | 1- | 12 | | | |
| MS25237-327 | 1-6 | 2 | | | 4 |
| MS35058-21 | 1-16 | 1 | | | |
| MS35206-212 | 1- | 22 | | | |
| MS35206-213 | 1- | 4 | | | |
| MS35206-214 | 1- | 3 | | | |
| MS35206-215 | 1- | 3 | | | |
| MS35206-216 | 1-26 | 2 | | | |
| MS35206-227 | 1- | 4 | | | |
| MS35206-27 | 1-66 | 1 | | | |
| PT02A-14-19P | 1-58 | 1 | P1 | S | |
| RC07GF101J | 5-12 | 1 | | | |
| RC07GF102J | 2-14 | 10 | | | |
| | 3-21 | | | | |
| | 4-7 | | | | |
| | 5-15 | | | | |
| RC07GF103J | 3-19 | 5 | | | |
| RC07GF104J | 3-11 | 1 | | | |
| RC07GF151J | 2-13 | 4 | | | |
| | 3-22 | | | | |
| | 4-13 | | | | |
| RC07GF152J | 4-12 | 1 | | | |
| RC07GF162J | 3-15 | 2 | | | |
| RC07GF182J | 3-13 | 1 | | | |
| RC07GF201J | 3-12 | 3 | | | |
| | 4-14 | | | | |
| | 5-11 | | | | |
| RC07GF202J | 2-7 | 2 | | | |
| | 5-16 | | | | |
| RC07GF203J | 3-23 | 2 | | | |
| RC07GF220J | 5-19 | 1 | | | |
| RC07GF222J | 2-9 | 3 | | | |
| | 3-24 | | | | |
| RC07GF223J | 3-25 | 1 | | | |
| RC07GF241J | 3-17 | 1 | | | |
| RC07GF243J | 3-16 | 2 | | | |
| RC07GF272J | 5-22 | 1 | | | |
| RC07GF3R3J | 2-9 | 1 | P1 | S | |
| RC07GF302J | 3-18 | 4 | | | |
| | 5-18 | | | | |
| RC07GF332J | 2-10 | 2 | | | |
| | 3-14 | | | | |
| RC07GF362J | 4-11 | 1 | | | |
| RC07GF390J | 4-16 | 1 | | | |
| RC07GF391J | 5-17 | 2 | | | |
| RC07GF392J | 4-8 | 1 | | | |
| RC07GF510J | 5-21 | 1 | | | |
| RC07GF511J | 4-10 | 4 | | | |
| | 5-13 | | | | |

| MFR PART NUMBER | FIG. AND INDEX NO. | QTY PER ART | SOURCE CODE | REPAIR CODE | EQUIP SPARES LEVEL |
|---|---|---|---|---|---|
| RC07GF561J | 2-12 | 3 | | | |
| | 4-9 | | | | |
| | 5-10 | | | | |
| RC07GF562J | 5-14 | 2 | | | |
| RC07GF621J | 5-20 | 1 | | | |
| RC07GF751J | 2-8 | 1 | | | |
| RC07GF822J | 2-11 | 2 | | | |
| | 3-20 | | | | |
| RC20GF182J | 2-15 | 1 | | | |
| RC32GF241J | 2-16 | 3 | | | |
| RC32GF681J | 2-17 | 1 | | | |
| RL42S151J | 2-18 | 1 | | | |
| R3801-0-109 | 4-27 | 2 | P1 | S | |
| Screw | 1- | 2 | P1 | S | |
| Screw | 1- | 4 | P1 | S | |
| Screw | 1- | 2 | P1 | S | |
| SE43 | 5-34 | 1 | X2 | | |
| SM2-2NE | 2-3 | 2 | P1 | S | |
| | 3-10 | | | | |
| SR6P-1 | 1-21 | 1 | P1 | S | |
| ST-SM-1 | 5-30 | 5 | P1 | S | |
| TGD50 | 2-1 | 1 | P1 | S | |
| UP121M | 1-22 | 1 | | | |
| VCJ1856 | 4-6 | 1 | P1 | S | |
| VC1G | 5-9 | 4 | P1 | S | |
| Washer | 1- | 1 | P1 | S | |
| X2043A | 5-33 | 13 | P1 | S | |
| X2043B | 2-31 | 19 | P1 | S | |
| | 3-43 | | | | |
| X2080B | 2-32 | 1 | P1 | S | |
| 025B3700-75 | 5-28 | 1 | P1 | S | |
| 1N1082 | 1-36 | 2 | P1 | S | 1 |
| 1N270 | 2-23 | 3 | P1 | S | 1 |
| | 3-27 | | | | |
| | 5-23 | | | | |
| 1N462 | 2-21 | 3 | P1 | S | 1 |
| | 3-29 | | | | |
| 1N627 | 3-28 | 4 | P1 | S | 1 |
| 1N676 | 3-30 | 2 | P1 | S | 1 |
| 1N968B | 2-22 | 1 | P1 | S | 1 |
| 100930-1 | 5-40 | 4 | X2 | | |
| 1103A | 1-38 | 2 | P1 | S | |
| 117580-1 | 1-42 | 1 | P2 | DM | |
| | 4- | REF | | | |
| 117583-1 | 1-40 | 1 | P2 | DM | |
| | 3- | REF | | | |
| 117587-1 | 1-37 | 1 | P2 | DM | |
| | 2- | REF | | | |
| 117602-1 | 1-45 | 1 | P2 | DM | |
| | 5- | REF | | | |
| 117603-2 | 5-35 | 1 | X2 | | |
| 117603-3 | 5-32 | 1 | X2 | | |
| 117686 | 1-63 | 1 | | | |
| 121001X | 2-29 | 4 | X2 | | |
| 12198-1 | 1-34 | 1 | P2 | S | |
| 1351 | 2-30 | 4 | X2 | | |
| 150D105X0035A2 | 3-9 | 2 | P1 | S | |
| 150D157X9015S2 | 2-4 | 1 | P1 | S | |
| 150D226X0035R2 | 2-5 | 1 | P1 | S | |
| 150D396X0010B2 | 2-6 | 1 | P1 | S | |
| 150D474X0035A2 | 3-7 | 1 | P1 | S | |

| MFR PART NUMBER | FIG. AND INDEX NO. | QTY PER ART | SOURCE CODE | REPAIR CODE | EQUIP SPARES LEVEL |
|---|---|---|---|---|---|
| 150D475X0010A2 | 2-2 | 1 | P1 | S | |
| 150D475X9035B2 | 3-8 | 1 | P1 | S | |
| 1537-709 | 5-25 | 1 | P1 | S | |
| 1537-718 | 4-17 | 1 | P1 | S | |
| 1537-730 | 3-33 | 2 | P1 | S | |
| | 5-24 | | | | |
| 162-8430-972 | 1-7 | 1 | P1 | S | |
| 162-8430-973 | 1-8 | 1 | P1 | S | |
| 192P1030R8 | 3-6 | 9 | P1 | S | |
| | 5-8 | | | | |
| 192P4730R8 | 3-5 | 2 | P1 | S | |
| 2N1132 | 3-36 | 1 | P1 | S | 1 |
| 2N176 | 1-25 | 1 | P1 | S | 1 |
| 2N3053 | 1-39 | 2 | P1 | S | 1 |
| 2N3283 | 1-44 | 5 | P1 | S | 2 |
| | 3-35 | | | | |
| 2N3293 | 4-21 | 1 | P1 | S | 1 |
| 2N3323 | 3-34 | 3 | P1 | S | 1 |
| 2N697 | 2-26 | 5 | P1 | S | 2 |
| | 3-37 | | | | |
| 2N708 | 4-20 | 1 | P1 | S | 1 |
| 2040B | 4-24 | 2 | P1 | S | |
| 2104-04-00 | 1-31 | 6 | P1 | S | |
| | 1-47 | | | | |
| | 1-56 | | | | |
| 2106300 | 1-28 | 2 | P1 | S | |
| 22-4122-40 | 1-61 | 10 | P1 | S | |
| 247296-4 | 1-41 | 1 | U | | |
| 2522-04-00 | 1-48 | 1 | P1 | S | |
| 267341-1 | 1-3 | 1 | X2 | | |
| 267379-1 | 1-62 | 1 | P1 | S | |
| 270327-1 | 1- | 8 | P1 | S | |
| | 1-53 | | | | |
| 284702-2 | 1-19 | 1 | X2 | | |
| 284711-3 | 4-23 | 1 | P1 | S | |
| 284714-3 | 3-42 | 1 | P1 | S | |
| 284718-3 | 2-27 | 1 | P1 | S | |
| 295202-4A | 1-54 | 1 | P1 | S | |
| 30055-8 | 1-35 | 1 | P2 | S | |
| 30588-1 | 3-44 | 9 | P1 | S | |
| | 4-25 | | | | |
| 36D262G050AB0C | 1-23 | 2 | P1 | S | |
| 39026-1 | 4-18 | 1 | P1 | S | |
| 39027-1 | 4-19 | 1 | P1 | S | |
| 39029-1 | 5-26 | 4 | P1 | S | |
| 39030-1 | 5-27 | 1 | P1 | S | |
| 40227-1 | 1-33 | 1 | P1 | S | |
| 40228-1 | 1-20 | 1 | P1 | S | |
| 42253-1 | 3-31 | 1 | P1 | S | |
| 42254-1 | 3-32 | 1 | P1 | S | |
| 432750-1 | 1-57 | 1 | M1 | | |
| 44B4 | 1-46 | 1 | P1 | S | |
| 4509 | 1-5 | 2 | P1 | S | |
| 4586-97A | 1-24 | 2 | P1 | S | |
| 5-4 | 5-29 | 3 | P1 | S | |
| 600500 | 1- | AR | | | |
| 601PE1040 | 3-40 | 1 | P1 | S | |
| 65838-1 | 1-17 | 1 | X2 | | |
| 68129-10 | 1-27 | 1 | X1 | | |
| 70-2WD-2G | 1-9 | 2 | P1 | S | |

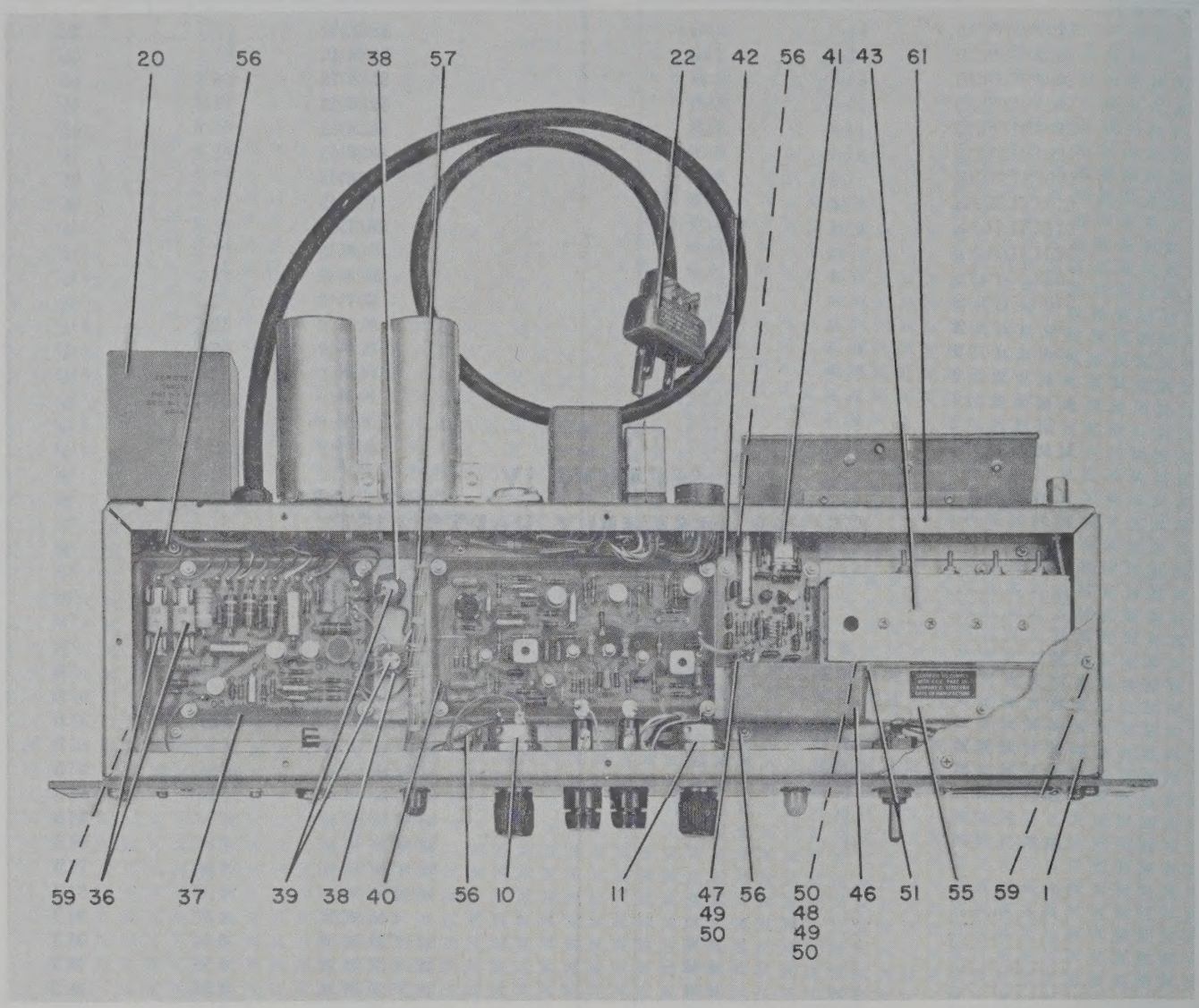
| MFR PART NUMBER | FIG. AND INDEX NO. | QTY PER ART | SOURCE CODE | REPAIR CODE | EQUIP SPARES LEVEL |
|---|---|---|---|---|---|
| 7717-18 | 3-39 | 7 | P1 | S | |
| | 4-22 | | | | |
| 7717-5 | 2-28 | 6 | P1 | S | |
| | 3-38 | | | | |
| 78013-1 | 1-59 | 2 | M | | |
| 8004-1G4 | 4-26 | 1 | P1 | S | |
| 80996-1 | 5- | 1 | X2 | | |
| 80997-3 | 1-60 | 1 | X2 | | |
| 80998-1 | 1-55 | 1 | X2 | | |
| 82416-1 | 1-18 | 1 | X2 | | |
| 8275 | 1-64 | 1 | | | |
| 865-N750-10 PFROMO5F 200VDCW | 4-3 | 1 | P1 | S | |
| 865-N750-15 PFPORM5PCT 200VDCW | 4-4 | 1 | P1 | S | |
| 882-3-2 | 2-20 | 2 | P1 | S | |
| 89743-1 | 1-1 | 1 | P1 | S | |
| 89776-1 | 1-2 | 1 | M1 | | |
| 89777-1 | 1-43 | 1 | M1 | | |
| 89778-1 | 5- | 1 | X2 | | |
| 89778-4 | 5- | 1 | X2 | | |
| 98778-2 | 5- | 1 | X2 | | |
| 98778-3 | 5- | 3 | X2 | | |
| 90-0-4180-11 | 1-65 | 1 | | | |
| 92469-2 | 1-51 | 1 | M | | |
| 97717-100 | 1- | 1 | P2 | DM | |

# SECTION III
# REFERENCE DESIGNATION INDEX

| REFERENCE DESIGNATION | FIG. AND INDEX NO. | MFR PART NUMBER |
|---|---|---|
| C1 | 5-2 | DM10C080D0100WV1CR |
| C2 | 5-9 | VC1G |
| C3 | 5-1 | GAO-24PFPORM5PCT |
| C4 | 5-9 | VC1G |
| C5 | 5-2 | DM10C080D0100WV1CR |
| C6 | 5-3 | DM10C680J0100WV4CR |
| C7 | 5-4 | DM10F241J0100WV1CR |
| C8 | 5-8 | 192P1030R8 |
| C9 | 5-3 | DM10C680J0100WV4CR |
| C10 | 5-2 | DM10C080D0100WV1CR |
| C11 | 5-9 | VC1G |
| C13 | 5-4 | DM10F241J0100WV1CR |
| C14 | 5-8 | 192P1030R8 |
| C15 | 5-2 | DM10C080D0100WV1CR |
| C16 | 5-9 | VC1G |
| C17 | 5-4 | DM10F241J0100WV1CR |
| C18 | 5-4 | DM10F241J0100WV1CR |
| C19 | 5-5 | DM10E750K0100WV4CR |
| C20 | 5-7 | DM10F201K0100WV4CR |
| C21 | 5-6 | DM10C560JP100WV4CR |
| C22 | 5-4 | DM10F241J0100WV1CR |
| C23 | 3-4 | DM10F241J0100WV1CR |
| C24 | 3-6 | 192P1030R8 |
| C25 | 3-3 | DM10F101J0100WV1CR |
| C26 | 3-6 | 192P1030R8 |
| C27 | 3-6 | 192P1030R8 |
| C28 | 3-6 | 192P1030R8 |
| C29 | 3-2 | DM15F102J0100WV1CR |
| C30 | 3-2 | DM15F102J0100WV1CR |
| C31 | 3-1 | DM10C111J0100WV4CR |
| C32 | 3-3 | DM10F101J0100WV1CR |
| C33 | 3-6 | 192P1030R8 |
| C34 | 3-8 | 150D475X9035B2 |
| C35 | 3-5 | 192P4730R8 |
| C36 | 3-9 | 150D105X0035A2 |
| C37 | 3-10 | SM2-2NE |
| C38 | 3-9 | 150D105X0035A2 |
| C39 | 3-7 | 150D474X0035A2 |
| C40 | 3-6 | 192P1030R8 |
| C41 | 4-1 | DM10F241J0100WV1CR |
| C42 | 4-1 | DM10F241J0100WV1CR |
| C43 | 4-1 | DM10F241J0100WV1CR |
| C44 | 4-1 | DM10F241J0100WV1CR |
| C45 | 4-1 | DM10F241J0100WV1CR |
| C46 | 4-6 | VCJ1856 |
| C47 | 4-4 | 865-N750-15PFPORM 5PCT200VDCW |
| C48 | 4-2 | DM10C220J0100WV1CR |
| C49 | 4-3 | 865-N750-10PFRORM 05PF200VDCW |
| C50 | 1-23 | 36D262G050AB0C |
| C51 | 1-23 | 36D262G050AB0C |
| C52 | 2-5 | 150D226X0035R2 |
| C53 | 2-2 | 150D475X0010A2 |
| C54 | 2-3 | SM2-2NE |
| C55 | 2-6 | 150D396X0010B2 |
| C56 | 2-4 | 150D157X9015S2 |
| C57 | 3-5 | 192P4730R8 |
| C59 | 4-5 | DM10C020D0100WV1CR |
| C60 | 4-5 | DM10C020D0100WV1CR |
| C61 | 4-1 | DM10F241J0100WV1CR |
| C62 | 5-4 | DM10F241J0100WV1CR |
| C63 | 5-8 | 192P1030R8 |
| C64 | 2-1 | TGD50 |
| C65 | 3-40 | 601PE104 |
| C66 | 3-41 | DM10C680K0100WV4CR |
| CR1 | 5-23 | 1N270 |
| CR2 | 3-29 | 1N462 |
| CR3 | 3-29 | 1N462 |
| CR4 | 3-28 | 1N627 |
| CR5 | 3-27 | 1N270 |
| CR6 | 3-30 | 1N676 |
| CR7 | 3-28 | 1N627 |
| CR8 | 3-30 | 1N676 |
| CR9 | 3-28 | 1N627 |
| CR10 | 2-24 | G100G |
| CR11 | 1-36 | 1N1082 |
| CR12 | 1-36 | 1N1082 |
| CR13 | 3-28 | 1N627 |
| CR14 | 2-24 | G100G |
| CR15 | 2-22 | 1N968B |
| CR16 | 2-21 | 1N462 |
| CR17 | 2-23 | 1N270 |
| DS2 | 1-6 | MS25237-327 |
| DS3 | 1-6 | MS25237-327 |
| FL1 | 1-46 | 44B4 |
| F1 | 1-13 | F02G1R00B |
| F2 | 1-12 | F02GR125A |
| F3 | 1-14 | F02GR250A |
| J1 | 5-28 | 025B3700-75 |
| J2 | 1-58 | PT02A-14-19P |
| J3 | 1-4 | JJ-089 |
| K1 | 1-34 | 12198-1 |
| L1 | 5-26 | 39029-1 |
| L2 | 5-26 | 39029-1 |
| L3 | 5-26 | 39029-1 |
| L4 | 5-26 | 39029-1 |
| L5 | 5-24 | 1537-730 |
| L6 | 5-27 | 39030-1 |
| L7 | 5-25 | 1537-709 |
| L8 | 3-33 | 1537-730 |
| L9 | 4-17 | 1537-718 |
| L10 | 4-18 | 39026-1 |
| L11 | 4-19 | 39027-1 |
| P1 | 1-22 | UP121M |
| Q1 | 1-44 | 2N3283 |

| REFERENCE DESIGNATION | FIG. AND INDEX NO. | MFR PART NUMBER |
|---|---|---|
| Q2 | 1-44 | 2N3283 |
| Q3 | 1-44 | 2N3283 |
| Q4 | 3-34 | 2N3323 |
| Q5 | 3-34 | 2N3323 |
| Q6 | 3-35 | 2N3283 |
| Q7 | 3-35 | 2N3283 |
| Q8 | 3-34 | 2N3323 |
| Q9 | 3-37 | 2N697 |
| Q10 | 3-36 | 2N1132 |
| Q11 | 3-37 | 2N697 |
| Q12 | 4-21 | 2N3293 |
| Q13 | 4-20 | 2N708 |
| Q14 | 1-25 | 2N176 |
| Q15 | 2-26 | 2N697 |
| Q16 | 2-26 | 2N697 |
| Q17 | 2-26 | 2N697 |
| Q18 | 1-39 | 2N3053 |
| Q19 | 1-39 | 2N3053 |
| R1 | 5-13 | RC07GF511J |
| R2 | 5-17 | RC07GF391J |
| R3 | 5-15 | RC07GF102J |
| R4 | 5-14 | RC07GF562J |
| R5 | 5-13 | RC07GF511J |
| R6 | 5-17 | RC07GF391J |
| R7 | 5-19 | RC07GF220J |
| R8 | 5-15 | RC07GF102J |
| R9 | 5-14 | RC07GF562J |
| R10 | 5-16 | RC07GF202J |
| R11 | 5-18 | RC07GF302J |
| R12 | 5-13 | RC07GF511J |
| R13 | 5-20 | RC07GF621J |
| R14 | 5-22 | RC07GF272J |
| R15 | 3-19 | RC07GF103J |
| R16 | 3-18 | RC07GF302J |
| R17 | 3-19 | RC07GF103J |
| R18 | 3-16 | RC07GF243J |
| R19 | 1-11 | CM33303 |
| R20 | 3-15 | RC07GF162J |
| R21 | 3-15 | RC07GF162J |
| R22 | 3-21 | RC07GF102J |
| R23 | 3-13 | RC07GF182J |
| R24 | 3-25 | RC07GF223J |
| R25 | 3-14 | RC07GF332J |
| R26 | 3-16 | RC07GF243J |
| R27 | 3-21 | RC07GF102J |
| R28 | 3-19 | RC07GF103J |
| R29 | 3-22 | RC07GF151J |
| R30 | 3-18 | RC07GF302J |
| R31 | 3-12 | RC07GF201J |
| R32 | 3-23 | RC07GF203J |
| R33 | 3-23 | RC07GF203J |
| R34 | 3-18 | RC07GF302J |
| R35 | 3-17 | RC07GF241J |
| R36 | 3-26 | FP504M |
| R37 | 3-21 | RC07GF102J |
| R38 | 3-19 | RC07GF103J |
| R39 | 3-24 | RC07GF222J |
| R40 | 3-24 | RC07GF222J |
| R41 | 3-20 | RC07GF822J |
| R42 | 3-19 | RC07GF103J |
| R43 | 3-11 | RC07GF104J |
| R44 | 4-11 | RC07GF362J |
| R45 | 4-12 | RC07GF152J |
| R46 | 4-7 | RC07GF102J |
| R47 | 4-13 | RC07GF151J |
| R48 | 4-10 | RC07GF511J |
| R49 | 4-7 | RC07GF102J |
| R50 | 4-8 | RC07GF392J |
| R51 | 4-9 | RC07GF561J |
| R52 | 4-7 | RC07GF102J |
| R53 | 4-14 | RC07GF201J |
| R55 | 2-16 | RC32GF241J |
| R56 | 2-16 | RC32GF241J |
| R57 | 2-18 | RL42S151J |
| R58 | 2-16 | RC32GF241J |
| R59 | 2-20 | 882-3-2 |
| R60 | 2-13 | RC07GF151J |
| R61 | 2-15 | RC20GF182J |
| R62 | 1-10 | CM33304 |
| R63 | 2-14 | RC07GF102J |
| R64 | 2-7 | RC07GF202J |
| R65 | 2-11 | RC07GF822J |
| R66 | 2-8 | RC07GF751J |
| R67 | 2-12 | RC07GF561J |
| R68 | 2-10 | RC07GF332J |
| R69 | 2-9 | RC07GF222J |
| R70 | 2-14 | RC07GF102J |
| R71 | 2-17 | RC32GF681J |
| R72 | 2-9 | RC07GF3R3J |
| R73 | 2-20 | 882-3-2 |
| R74 | 4-16 | RC07GF390J |
| R76 | 5-21 | RC07GF510J |
| R77 | 5-10 | RC07GF561J |
| R78 | 5-12 | RC07GF101J |
| R79 | 5-11 | RC07GF201J |
| R80 | 3-22 | RC07GF151J |
| S3 | 1-16 | MS35058-21 |
| T1 | 3-31 | 42253-1 |
| T2 | 3-32 | 42254-1 |
| T3 | 1-20 | 40228-1 |
| T4 | 2-25 | LB019 |
| T5 | 1-33 | 40227-1 |
| XF1 | 1-15 | HKP |
| XF2 | 1-15 | HKP |
| XDS2 | 1-7 | 162-8430-972 |
| XDS3 | 1-8 | 162-8430-973 |
| XK1 | 1-35 | 30055-8 |
| XQ1 | 1-29 | 5-4 |
| XQ2 | 1-29 | 5-4 |
| XQ3 | 1-29 | 5-4 |
| XY1 | 4-26 | 8004-1G4 |
| Y1 | 1-41 | 247296-4 |

# SECTION IV
# GROUP ASSEMBLY PARTS LIST



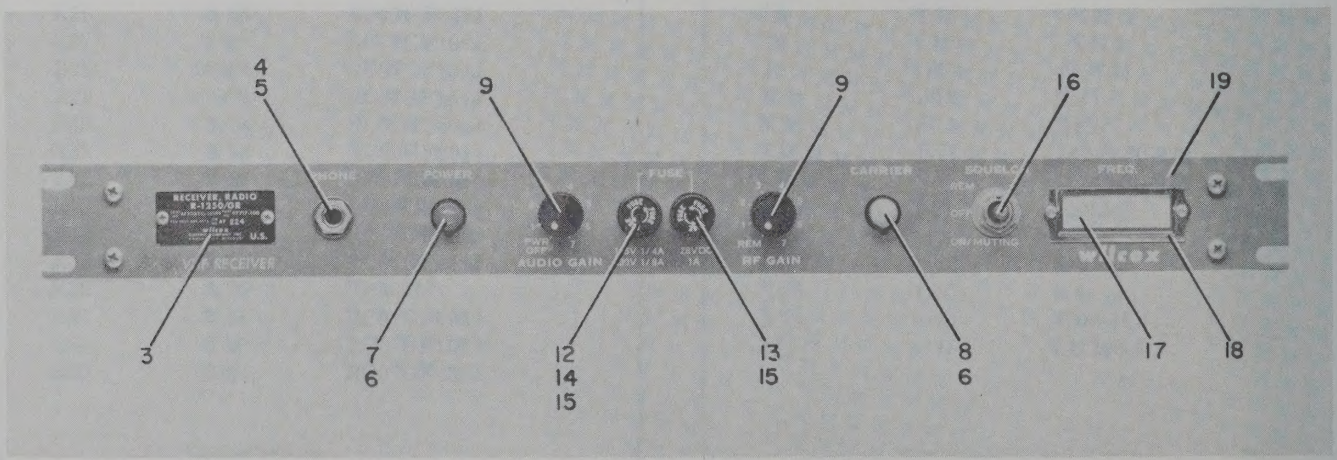




*Figure 1. Radio Receiver R-1250/GR (Sheet 1 of 2)*

| FIG. AND INDEX NO. | MFR PART NUMBER | 1 2 3 4 5 6 7 8 9 DESCRIPTION | MFR CODE | UNITS PER ASSY | USE ON CODE |
|---|---|---|---|---|---|
| 1- | 97717-100 | RADIO RECEIVER R-1250/GR (Equipment spares package available) | | 1 | |
| -1 | 89743-1 | . COVER, Radio receiver | | 1 | |
| | | ATTACHING PARTS | | | |
| | MS35206-212 | . SCREW | | 8 | |
| | | ----*---- | | | |
| -2 | 89776-1 | . COVER, Receiver | | 1 | |
| | | ATTACHING PARTS | | | |
| | MS35206-212 | . SCREW, Machine | | 8 | |
| | AN935-4 | . WASHER | | 8 | |
| | | ----*---- | | | |
| -3 | 267341-1 | . PLATE, Identification | | 1 | |
| | | ATTACHING PARTS | | | |
| | COML | . SCREW, Mach, panhd, Phlh, brs, nipl, 4-40NC-2x3/16 | | 2 | |
| | AN935B4 | . WASHER | | 2 | |
| | | ----*---- | | | |
| -4 | JJ-089 | . JACK, Phone | 82389 | 1 | |
| | | ATTACHING PARTS | | | |
| -5 | 4509 | . WASHER, Shouldered | 14871 | 2 | |
| | | ----*---- | | | |
| -6 | MS25237-327 | . LAMP, Incandescent | | 2 | |
| -7 | 162-8430-972 | . LIGHT, Indicator | 72619 | 1 | |
| -8 | 162-8430-973 | . LIGHT, Indicator | 72619 | 1 | |
| -9 | 70-2WD-2G | . KNOB | 49956 | 2 | |
| -10 | CM33304 | . RESISTOR, Variable, 5,000 ohms, ±10%, 1 watt | 12697 | 1 | |
| -11 | CM33303 | . RESISTOR, Variable, 100,000 ohms, ±10%, 2 watts | 12697 | 1 | |
| | | ATTACHING PARTS | | | |
| | AN935-616L | . WASHER | | 2 | |
| | | ----*---- | | | |
| -12 | F02GR125A | . FUSE, Cartridge | | 1 | |
| -13 | F02G1R00B | . FUSE, Cartridge | | 1 | |
| -14 | F02GR250A | . FUSE, Cartridge | | 1 | |
| -15 | HKP | . FUSE HOLDER | 71400 | 2 | |
| -16 | MS35058-21 | . SWITCH, Toggle | | 1 | |
| -17 | 65838-1 | . WINDOW, Card | | 1 | |
| -18 | 82416-1 | . HOLDER, Card | | 1 | |
| | | ATTACHING PARTS | | | |
| | COML | . SCREW, Mach, panhd, Phlh, brs nipl, 2-56NC-2x3/16 | | 2 | |
| | AN935B2 | . WASHER | | 2 | |
| | | ----*---- | | | |
| -19 | 284702-2 | . PANEL, Front | | 1 | |
| | | ATTACHING PARTS | | | |
| | COML | . SCREW, Mach, panhd, Phlh, brs nipl, 8-32NC-2x1/2 | | 4 | |
| | AN935B8 | . WASHER | | 4 | |
| | | ----*---- | | | |
| -20 | 40228-1 | . TRANSFORMER, Power, primary voltage 115/230 vrms, frequency 45 to 450 cps; secondary 53.5 vrms at 280 ma dc. | | 1 | |
| | | ATTACHING PARTS | | | |
| | AN935-6 | . WASHER | | 4 | |
| | AN340-6 | . NUT | | 4 | |
| | | ----*---- | | | |
| -21 | SR6P-1 | . BUSHING, Strain | 28520 | 1 | |
| -22 | UP121M | . CONNECTOR, Plug, 3 contact, 125 v ac, 15 amp. | 90002 | 1 | |
| -23 | 36D262G050AB0C | . CAPACITOR, Electrolytic, 2600uf, +75—20%, 50 vdcw. | 56289 | 2 | |
| -24 | 4586-97A | . RETAINER, Capacitor | 56289 | 2 | |
| | | ATTACHING PARTS | | | |
| | MS35206-227 | . SCREW | | 4 | |
| | AN935-6 | . WASHER | | 4 | |
| | AN340-6 | . NUT | | 4 | |
| | | ----*---- | | | |

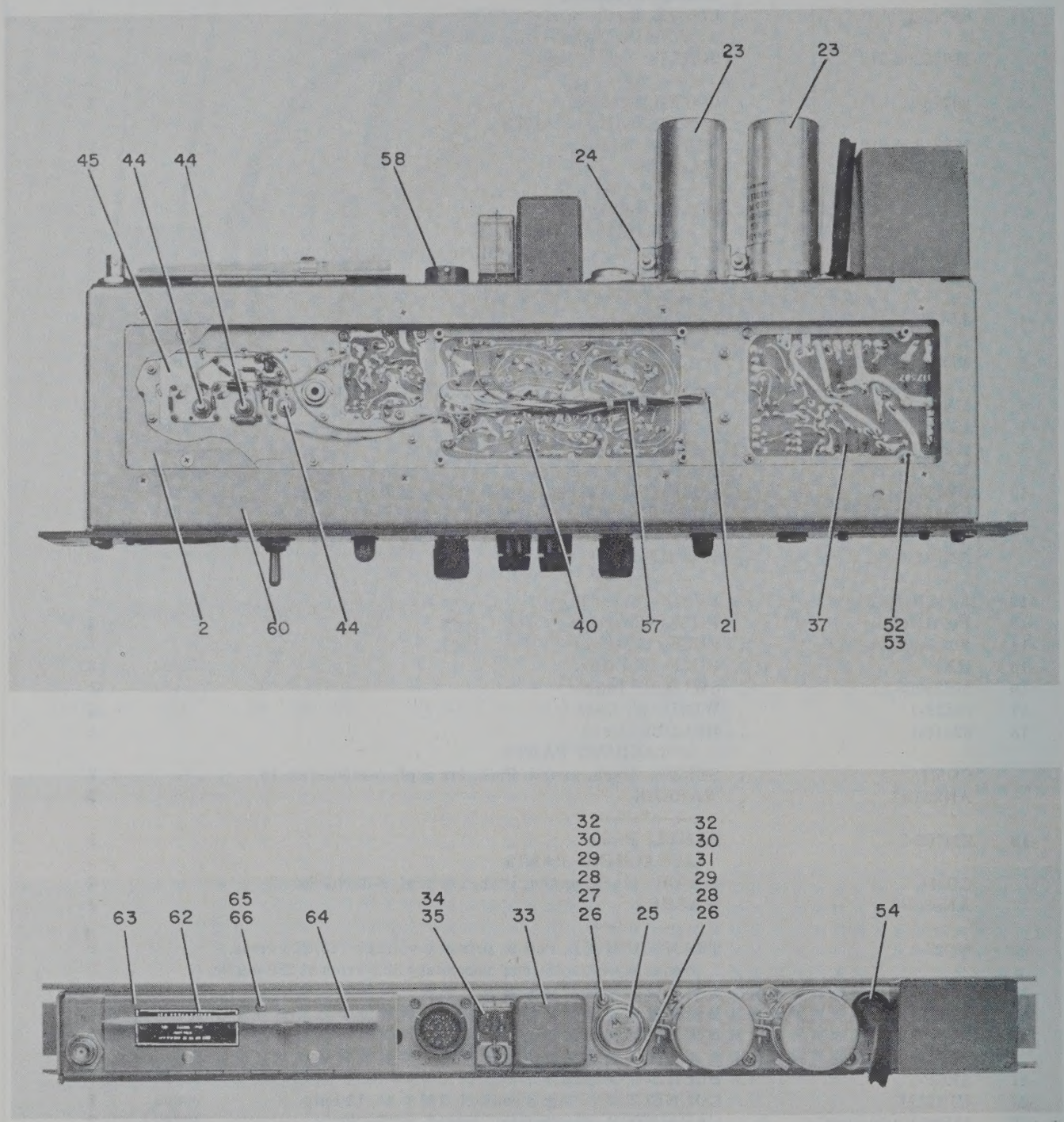



*Figure 1. Radio Receiver R-1250/GR (Sheet 2 of 2)*

| FIG. AND INDEX NO. | MFR PART NUMBER | DESCRIPTION 1 2 3 4 5 6 7 8 9 | MFR CODE | UNITS PER ASSY | USE ON CODE |
|---|---|---|---|---|---|
| 1-25 | 2N176 | . TRANSISTOR, PNP, Germanium | 80131 | 1 | |
| | | ATTACHING PARTS | | | |
| -26 | MS35206-216 | . SCREW | | 2 | |
| -27 | 68129-10 | . WAFER, insulated | | 1 | |
| -28 | 2106300 | . INSULATED, Bushing | 83298 | 2 | |
| -29 | AN960-4 | . WASHER | | 2 | |
| -30 | AN935-4 | . WASHER | | 2 | |
| -31 | 2104-04-00 | . TERMINAL, Lug | 78189 | 1 | |
| -32 | AN340-4 | . NUT | | 2 | |
| | | ----*---- | | | |
| -33 | 40227-1 | . TRANSFORMER, Audio frequency, primary 21 vrms; secondary 143 vrms, 25 vrms, 4.6 vrms, and 2.5 rms | | 1 | |
| | | ATTACHING PARTS | | | |
| | AN935-6 | . WASHER | | 2 | |
| | AN340-6 | . NUT | | 2 | |
| | | ----*---- | | | |
| -34 | 12198-1 | . RELAY, Armature, 4 form "C" contacts, 10.8 ma dc, 1550 ohms, 29 vdc. | | 1 | |
| -35 | 30055-8 | . SOCKET, Relay | 70309 | 1 | |
| | | ATTACHING PARTS | | | |
| | MS35206-214 | . SCREW | | 1 | |
| | AN935-4 | . WASHER | | 1 | |
| | AN340-4 | . NUT | | 1 | |
| | | ----*---- | | | |
| -36 | 1N1082 | . SEMICONDUCTOR DEVICE, Diode, silicon | 80131 | 2 | |
| -37 | 117587-1 | . POWER SUPPLY SUBASSEMBLY (see figure 2) | | 1 | |
| | | ATTACHING PARTS | | | |
| | 270327-1 | . SPACER, Hex | | 2 | |
| | MS35206-214 | . SCREW | | 2 | |
| | AN960-4 | . WASHER | | 4 | |
| | AN935-4 | . WASHER | | 4 | |
| | AN340-4 | . NUT | | 4 | |
| | | ----*---- | | | |
| -38 | 1103A | . HEAT SINK | 13103 | 2 | |
| | | ATTACHING PARTS | | | |
| | MS35206-212 | . SCREW | | 2 | |
| | AN935-4 | . WASHER | | 2 | |
| | | ----*---- | | | |
| -39 | 2N3053 | . TRANSISTOR, NPN, silicon | 89131 | 2 | |
| -40 | 117583-1 | . IF BOARD SUBASSEMBLY (see figure 3) | | 1 | |
| | | ATTACHING PARTS | | | |
| | 270327-1 | . SPACER, Hex | | 4 | |
| | AN960-4 | . WASHER | | 4 | |
| | AN935-4 | . WASHER | | 4 | |
| | AN340-4 | . NUT | | 4 | |
| | | ----*---- | | | |
| -41 | 247296-4 | . CRYSTAL, Quartz, fifth-overtone mode of the fundamental frequency, modified HC-25/U holder, frequency range 50 to 134 mc (frequency specified) temperature range −30° C to +70° C, frequency tolerance ±0.0015% | | 1 | |
| -42 | 117580-1 | . OSCILLATOR SUBASSEMBLY (see figure 4) | | 1 | |
| | | ATTACHING PARTS | | | |
| | MS35206-215 | SCREW | | 3 | |
| | COML | . WASHER, Non-metallic, for No. 4 screw | | 1 | |
| | AN960-4 | . WASHER | | 5 | |
| | AN935-4 | . WASHER | | 3 | |
| | AN340-4 | . NUT | | 3 | |
| | | ----*---- | | | |

| FIG. AND INDEX NO. | MFR PART NUMBER | DESCRIPTION 1 2 3 4 5 6 7 8 9 | MFR CODE | UNITS PER ASSY | USE ON CODE |
|---|---|---|---|---|---|
| 1-43 | 89777-1 | . SHIELD, Electrical | | 1 | |
| | | ATTACHING PARTS | | | |
| | MS35206-212 | . SCREW | | 4 | |
| | AN935-4 | . WASHER | | 4 | |
| | | ----*---- | | | |
| -44 | 2N3283 | . TRANSISTOR, PNP, germanium | 80131 | 3 | |
| -45 | 117602-1 | . RF AND MIXER SUBASSEMBLY (see figure 5) | | 1 | |
| | | ATTACHING PARTS | | | |
| | MS35206-213 | . SCREW | | 4 | |
| | AN935-4 | . WASHER | | 4 | |
| | AN340-4 | . NUT | | 4 | |
| | | ----*---- | | | |
| -46 | 44B4 | . FILTER, Bandpass, center frequency 17 mc, 17.5 kc bandwidth at 6 db, input voltage 5 vrms. | 00136 | 1 | |
| | | ATTACHING PARTS | | | |
| -47 | 2104-04-00 | . TERMINAL, Lug | 78189 | 1 | |
| -48 | 2522-04-00 | . TERMINAL, Lug | 78189 | 1 | |
| -49 | AN935-4 | . WASHER | | 2 | |
| -50 | AN340-4 | . NUT | | 3 | |
| | | ----*---- | | | |
| -51 | 92469-2 | . BRACKET, Filter mounting | | 1 | |
| | | ATTACHING PARTS | | | |
| | AN935-4 | . WASHER | | 2 | |
| | AN340-4 | . NUT | | 2 | |
| | | ----*---- | | | |
| -52 | FHS-440-4 | . . STUD, Captive | 46384 | 2 | |
| -53 | 270327-1 | . SPACER, Hex | | 2 | |
| | | ATTACHING PARTS | | | |
| | AN935-4 | . WASHER | | 2 | |
| | AN340-4 | . NUT | | 2 | |
| | | ----*---- | | | |
| -54 | 295202-4A | . GROMMET, Plastic | 76530 | 1 | |
| -55 | 80998-1 | . CHASSIS, Electrical equipment | | 1 | |
| | | ATTACHING PARTS | | | |
| | MS24693-S3 | . SCREW | | 8 | |
| -56 | 2104-04-00 | . TERMINAL, Lug | | 4 | |
| | AN935-4 | . WASHER | | 8 | |
| | AN340-4 | . NUT | | 8 | |
| | | ----*---- | | | |
| -57 | 432750-1 | . WIRING HARNESS, branched | | 1 | |
| | | ATTACHING PARTS | | | |
| | MS24693-S3 | . SCREW | | 4 | |
| | AN935-4 | . WASHER | | 4 | |
| | AN340-4 | . NUT | | 4 | |
| | | ----*---- | | | |
| -58 | PT02A-14-19P | . . CONNECTOR, Receptacle | 77820 | 1 | |
| -59 | 78013-1 | . BLOCK, Mounting | | 2 | |
| | | ATTACHING PARTS | | | |
| | MS24693-S28 | . SCREW | | 4 | |
| | MS24693-S26 | . SCREW | | 4 | |
| | AN935-6 | . WASHER | | 8 | |
| | AN340-6 | . NUT | | 8 | |
| | | ----*---- | | | |
| -60 | 80997-3 | . CHASSIS, Electrical equipment | | 1 | |
| -61 | 22-4122-40 | . . NUT, Self-locking, clinch | 72962 | 10 | |
| | | | | 1 | |
| -62 | 267379-1 | . PLATE, Identification | | 1 | |
| -63 | 117686 | . COVER, Subassembly | | 1 | |
| -64 | 8275 | . TOOL, Alignment | 72653 | 1 | |
| -65 | 90-0-4180-11 | . RING, Retaining | 94222 | 1 | |
| -66 | MS35206-27 | SCREW | | 1 | |
| | 600500 | EQUIPMENT SPARES PACKAGE | AR | | |

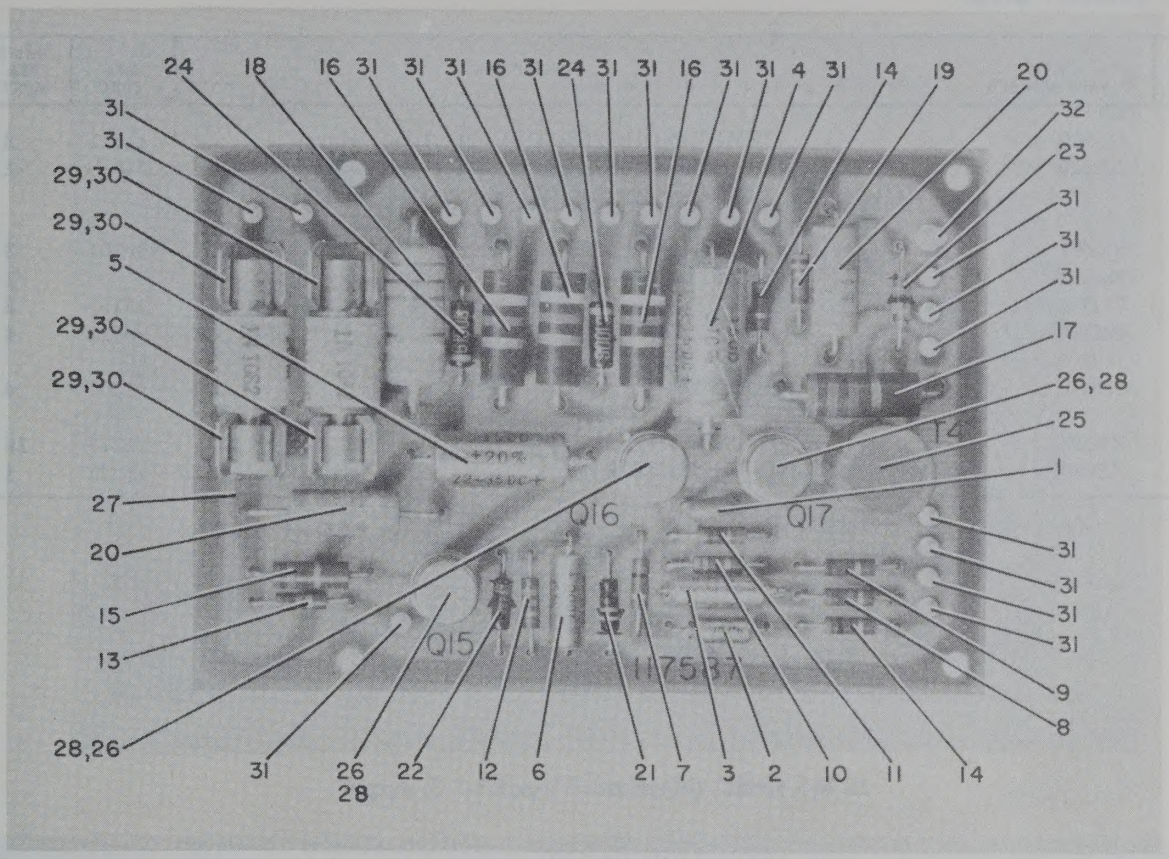



*Figure 2. Power Supply Subassembly*

| FIG. AND INDEX NO. | MFR PART NUMBER | DESCRIPTION 1 2 3 4 5 6 7 8 9 | MFR CODE | UNITS PER ASSY | USE ON CODE |
|---|---|---|---|---|---|
| 2- | 117587-1 | . POWER SUPPLY SUBASSEMBLY (see figure 1 for NHA) | | REF | |
| -1 | TGD50 | . . CAPACITOR, Ceramic, 005 uf, +80 −20%; 50 vdcw | 56289 | 1 | |
| -2 | 150D475X0010A2 | . . CAPACITOR, Electrolytic, 4.7 uf, 20%, 10 vdcw | 56289 | 1 | |
| -3 | SM2-2NE | . . CAPACITOR, Electrolytic, 2.2 uf, 35 vdcw | 14433 | 1 | |
| -4 | 150D157X9015S2 | . . CAPACITOR, Electrolytic, 150 uf, 10%, 15 vdcw | 56289 | | |
| -5 | 150D226X0035R2 | . . CAPACITOR, Electrolytic, 22 uf, 10%, 35 vdcw | 56289 | 1 | |
| -6 | 150D396X0010B2 | . . CAPACITOR, Electrolytic, 39 uf, 20%, 10 vdcw | 56289 | 1 | |
| -7 | RC07GF202J | . . RESISTOR | | 1 | |
| -8 | RC07GF751J | . . RESISTOR | | 1 | |
| -9 | RC07GF222J | . . RESISTOR | | 1 | |
| -10 | RC07GF332J | . . RESISTOR | | 1 | |
| -11 | RC07GF822J | . . RESISTOR | | 1 | |
| -12 | RC07GF561J | . . RESISTOR | | 1 | |
| -13 | RC07GF151J | . . RESISTOR | | 1 | |
| -14 | RC07GF102J | . . RESISTOR | | 2 | |
| -15 | RC20GF182J | . . RESISTOR | | 1 | |
| -16 | RC32GF241J | . . RESISTOR | | 3 | |
| -17 | RC32GF681J | . . RESISTOR | | 1 | |
| -18 | RL42S151J | . . RESISTOR | | 1 | |
| -19 | RC07GF3R3J | . . RESISTOR | | 1 | |
| -20 | 882-3-2 | . . RESISTOR, Wirewound, 2 ohms, 3%, 3w | 44655 | 2 | |
| -21 | 1N462 | . . SEMICONDUCTOR DEVICE, Diode, silicon | 44655 | 2 | |
| -22 | 1N968B | . . SEMICONDUCTOR DEVICE, Diode zener, 20 v, 15 ma, ½w, silicon | 80131 | 1 | |
| -23 | 1N270 | . . SEMICONDUCTOR DEVICE, Diode germanium | 80131 | 1 | |

| FIG. AND INDEX NO. | MFR PART NUMBER | 1 2 3 4 5 6 7 8 9 DESCRIPTION | MFR CODE | UNITS PER ASSY | USE ON CODE |
|---|---|---|---|---|---|
| 2-24 | G100G | . . SEMICONDUCTOR DEVICE, Diode silicon | 11711 | 2 | |
| -25 | LB019 | . . TRANSFORMER, Audio Frequency, primary impedance 300 ohm CT, secondary impedance 600 ohms | 07388 | 1 | |
| -26 | 2N697 | . . TRANSISTOR, NPN, silicon | 80131 | 3 | |
| -27 | 284718-3 | . . BOARD, Printed circuit | | 1 | |
| -28 | 7717-5 clear | . . PAD, Transistor mounting | 13103 | 3 | |
| -29 | 121001X | . . . CLIP, Electrical | 75915 | 4 | |
| | | ATTACHING PARTS | | | |
| -30 | 1351 | . . . RIVET, Tubular | 61007 | 4 | |
| | | ----*---- | | | |
| -31 | X2043B | . . . TERMINAL, Stud | 71279 | 19 | |
| -32 | X2080B | . . . TERMINAL, Stud | 71279 | 1 | |

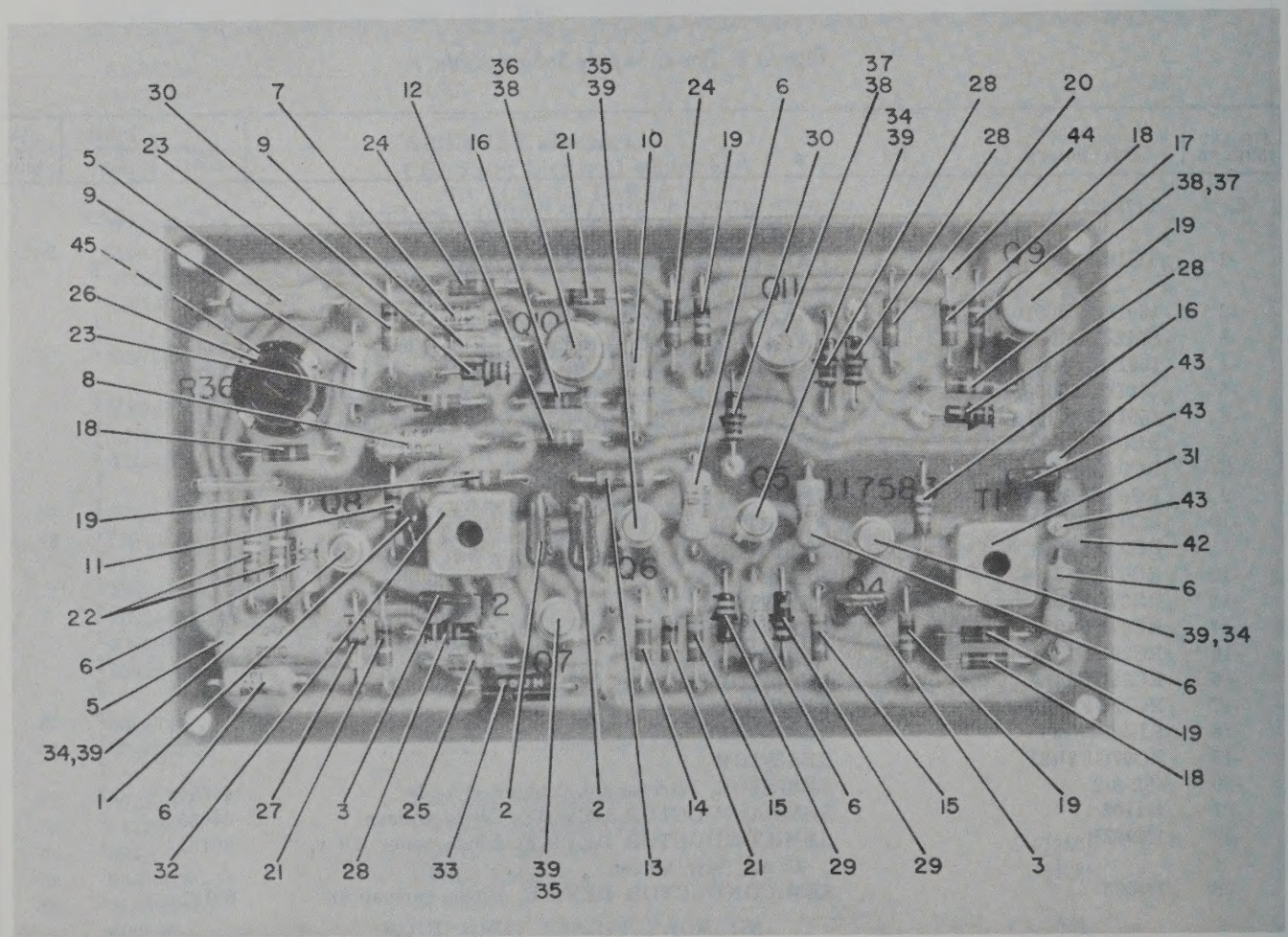



*Figure 3. I-f Board Subassembly (Sheet 1 of 2)*

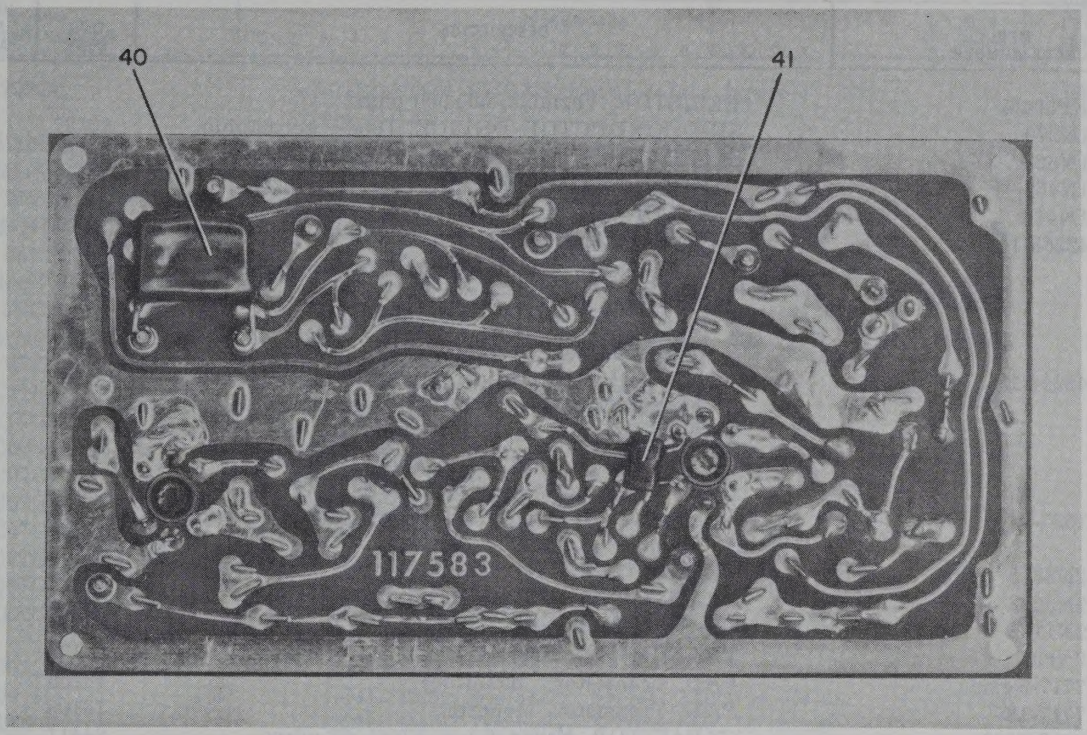



*Figure 3. I-f Board Subassembly (Sheet 2 of 2)*

| FIG. AND INDEX NO. | MFR PART NUMBER | 1 2 3 4 5 6 7 8 9 DESCRIPTION | MFR CODE | UNITS PER ASSY | USE ON CODE |
|---|---|---|---|---|---|
| 3- | 117583-1 | . IF BOARD SUBASSEMBLY (see figure 1 for NHA) | | REF | |
| -1 | DM10C111J0100 WV4CR | . . CAPACITOR, Mica, 110 uuf, 5%, 100 vdcw | 72136 | 1 | |
| -2 | DM15F102J0100 WV1CR | . . CAPACITOR, Mica, 1000 uuf, 5%, 100 vdcw | 72136 | 2 | |
| -3 | DM10F101J0100 WV1CR | . . CAPACITOR, Mica, 100 uuf, 5%, 100 vdcw | 72136 | 2 | |
| -4 | DM10F241J0100 WV1CR | . . CAPACITOR, Mica, 240 uuf, 5%, 100 vdcw | 72136 | 1 | |
| -5 | 192P4730R8 | . . CAPACITOR, Plastic, .047 uf, 20%, 80 vdcw | 56289 | 2 | |
| -6 | 192P1030R8 | . . CAPACITOR, Plastic, .01 uf, 20%, 80 vdcw | 56289 | 6 | |
| -7 | 150D474X0035A2 | . . CAPACITOR, Electrolytic, .47 uf, 20%, 35 vdcw | 56289 | 1 | |
| -8 | 150D475X9035B2 | . . CAPACITOR, Electrolytic, 4.7 uf, 20%, 35 vdcw | 56289 | 1 | |
| -9 | 150D105X0035A2 | . . CAPACITOR, Electrolytic, 1 uf, 20%, 35 vdcw | 56289 | 2 | |
| -10 | SM2-2NE | . . CAPACITOR, Electrolytic, 2.2 uf, 35 vdcw | 14433 | 1 | |
| -11 | RC07GF104J | . . RESISTOR | | 1 | |
| -12 | RC07GF201J | . . RESISTOR | | 1 | |
| -13 | RC07GF182J | . . RESISTOR | | 1 | |
| -14 | RC07GF332J | . . RESISTOR | | 1 | |
| -15 | RC07GF162J | . . RESISTOR | | 2 | |
| -16 | RC07GF243J | . . RESISTOR | | 2 | |
| -17 | RC07GF241J | . . RESISTOR | | 1 | |
| -18 | RC07GF302J | . . RESISTOR | | 3 | |
| -19 | RC07GF103J | . . RESISTOR | | 5 | |
| -20 | RC07GF822J | . . RESISTOR | | 1 | |
| -21 | RC07GF102J | . . RESISTOR | | 3 | |
| -22 | RC07GF151J | . . RESISTOR | | 2 | |
| -23 | RC07GF203J | . . RESISTOR | | 2 | |
| -24 | RC07GF222J | . . RESISTOR | | 2 | |
| -25 | RC07GF223J | . . RESISTOR | | 1 | |

| FIG. AND INDEX NO. | MFR PART NUMBER | DESCRIPTION 1 2 3 4 5 6 7 8 9 | MFR CODE | UNITS PER ASSY | USE ON CODE |
|---|---|---|---|---|---|
| 3-26 | FP504M | . . RESISTOR, Variable, 500,000 ohms | | 1 | |
| -27 | 1N270 | . . SEMICONDUCTOR DEVICE, Diode, germanium | 80131 | 1 | |
| -28 | 1N627 | . . SEMICONDUCTOR DEVICE, Diode, silicon | 80131 | 4 | |
| -29 | 1N462 | . . SEMICONDUCTOR DEVICE, Diode, silicon | 80131 | 2 | |
| -30 | 1N676 | . . SEMICONDUCTOR DEVICE, Diode, silicon | 80131 | 2 | |
| -31 | 42253-1 | . . TRANSFORMER, IF, primary 5 ¼ turns No. 24 magnet wire close wound over the secondary. Secondary 9 ¼ turns No. 24 magnet wire close wound. Slug tuned primary 0.20 uh, ±20% at 25 mc, secondary 0.40 uh ±20% at 25 mc. | | 1 | |
| -32 | 42254-1 | . . TRANSFORMER, IF, primary 5 ¾ turns No. 24 magnet wire close wound over secondary, Secondary 9 ¼ turns No. 24 magnet wire close wound. Slug tuned primary 0.20 uh, ±20% at 25 mc, secondary 0.40 uh, ±20% at 25 mc. | | 1 | |
| -33 | 1537-730 | . . COIL, Radio frequency, 68 uh, ±10% at 2.5 mc; 240 madc, 2.5 ohms. | 99800 | 1 | |
| -34 | 2N3323 | . . TRANSISTOR, PNP, germanium | 80131 | 3 | |
| -35 | 2N3283 | . . TRANSISTOR, PNP, germanium | 80131 | 2 | |
| -36 | 2N1132 | . . TRANSISTOR, NPN, silicon | 80131 | 1 | |
| -37 | 2N697 | . . TRANSISTOR, PNP, silicon | 80131 | 2 | |
| -38 | 7717-5 clear | . . PAD, Transistor, mounting | 13103 | 3 | |
| -39 | 7717-18 | . . PAD, Transistor, mounting | 13103 | 5 | |
| -40 | 601PE1080 | . . CAPACITOR, Mylar, 0.1 u ±10% 50 vdcw | 84411 | 1 | |
| -41 | DM10C680K0100 WV4CR | . . CAPACITOR, Mica, 68 uufd ±10% 100 vdcw | 72136 | 1 | |
| -42 | 284714-3 | . . BOARD, Printed Circuit | | 1 | |
| -43 | X2043B | . . . TERMINAL, Lug | 71279 | 2 | |
| -44 | 30588-1 | . . . TERMINAL, Stud | | 9 | |
| -45 | CE63F | . . . EYELET, Metal | 04264 | 3 | |

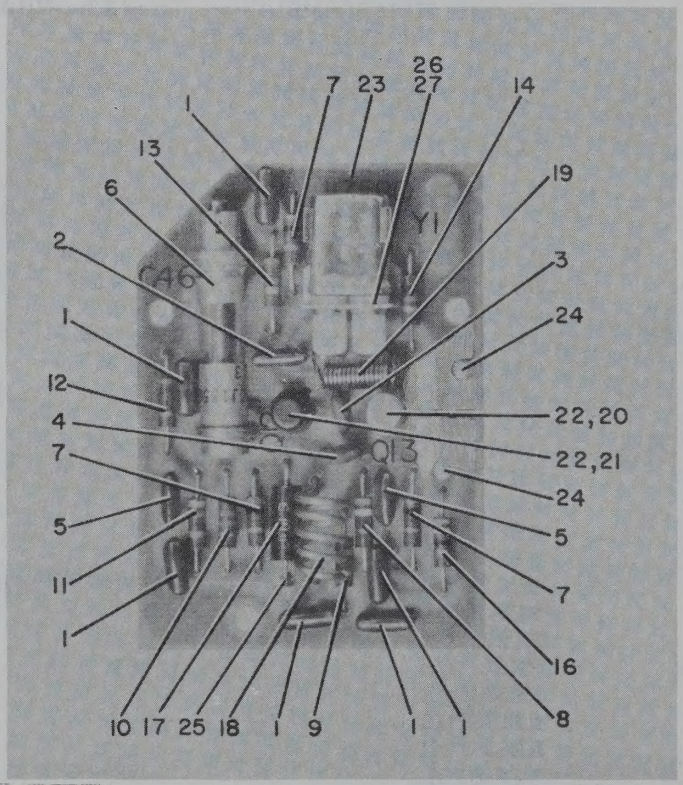
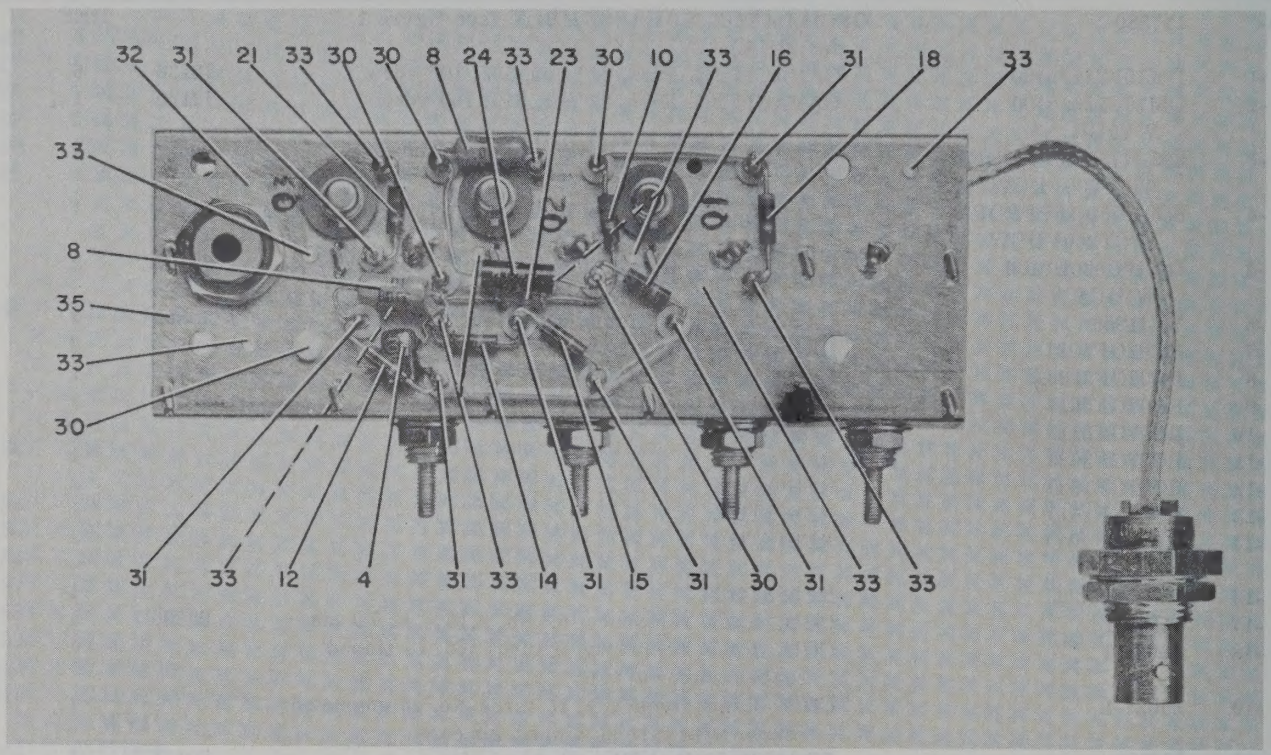



*Figure 4. Oscillator Subassembly*

| FIG. AND INDEX NO. | MFR PART NUMBER | 1 2 3 4 5 6 7 8 9 DESCRIPTION | MFR CODE | UNITS PER ASSY | USE ON CODE |
|---|---|---|---|---|---|
| 4- | 117580-1 | . OSCILLATOR SUBASSEMBLY (see figure 1 for NHA) | | REF | |
| -1 | DM10F241J0100 | . . CAPACITOR, Mica, 240 uuf, 5%, 100 vdcw | 72136 | 6 | |
| -2 | DM10C220J0100 WV1CR | . . CAPACITOR, Mica, 22 uuf, 5%, 100 vdcw | 72136 | 1 | |
| -3 | 865-N750-10PFRORM 05PF200VDCW | . . CAPACITOR, Ceramic, 10 uuf, 5%, 100 vdcw | 72982 | 1 | |
| -4 | 865-N750-15PFPORM 5PCT200VDCW | . . CAPACITOR, Ceramic, 15 uuf, 5%, 100 vdcw | 72982 | 1 | |
| -5 | DM10C020D0100 WV1CR | . . CAPACITOR, Mica, 2 uuf, ±.5 uuf, 100 vdcw | 72136 | 2 | |
| -6 | VCJ1856 | . . CAPACITOR, Variable, 0.8-18 uuf. | 73899 | 1 | |
| -7 | RC07GF102J | . . RESISTOR | | 3 | |
| -8 | RC07GF392J | . . RESISTOR | | 1 | |
| -9 | RC07GF561J | . . RESISTOR | | 1 | |
| -10 | RC07GF511J | . . RESISTOR | | 1 | |
| -11 | RC07GF362J | . . RESISTOR | | 1 | |
| -12 | RC07GF152J | . . RESISTOR | | 1 | |
| -13 | RC07GF151J | . . RESISTOR | | 1 | |
| -14 | RC07GF201J | . . RESISTOR | | 1 | |
| -16 | RC07GF390J | . . RESISTOR | | 1 | |
| -17 | 1537-718 | . . COIL, Radio frequency, 6.8 uh, ±10% at 7.9 mc | 99800 | 1 | |
| -18 | 39026-1 | . . COIL, Radio frequency, 5 turns No. 18 tinned copper wire, air core. | | 1 | |
| -19 | 39027-1 | . . COIL, Radio frequency, 15 turns No. 25 enameled copper wire varnish dipped, air core. | | 1 | |
| -20 | 2N708 | . . TRANSISTOR, NPN, silicon | 80131 | 1 | |
| -21 | 2N3293 | . . TRANSISTOR, NPN, silicon | 80131 | 1 | |
| -22 | 7717-18 | . . PAD, Transistor mounting | 13103 | 2 | |
| | | ATTACHING PARTS | | | |
| -23 | 284711-3 | . . BOARD, Printed circuit | | 1 | |
| -24 | 2040B | . . . TERMINAL, Stud | 71279 | 2 | |
| -25 | 30588-1 | . . . TERMINAL, Stud | | 1 | |
| -26 | 8004-1G4 | . . . SOCKET, Crystal | 91506 | 1 | |
| | | ATTACHING PARTS | | | |
| -27 | R3801-0-109 | . . . RIVET, Tubular | 12014 | 2 | |
| | | ----*---- | | | |



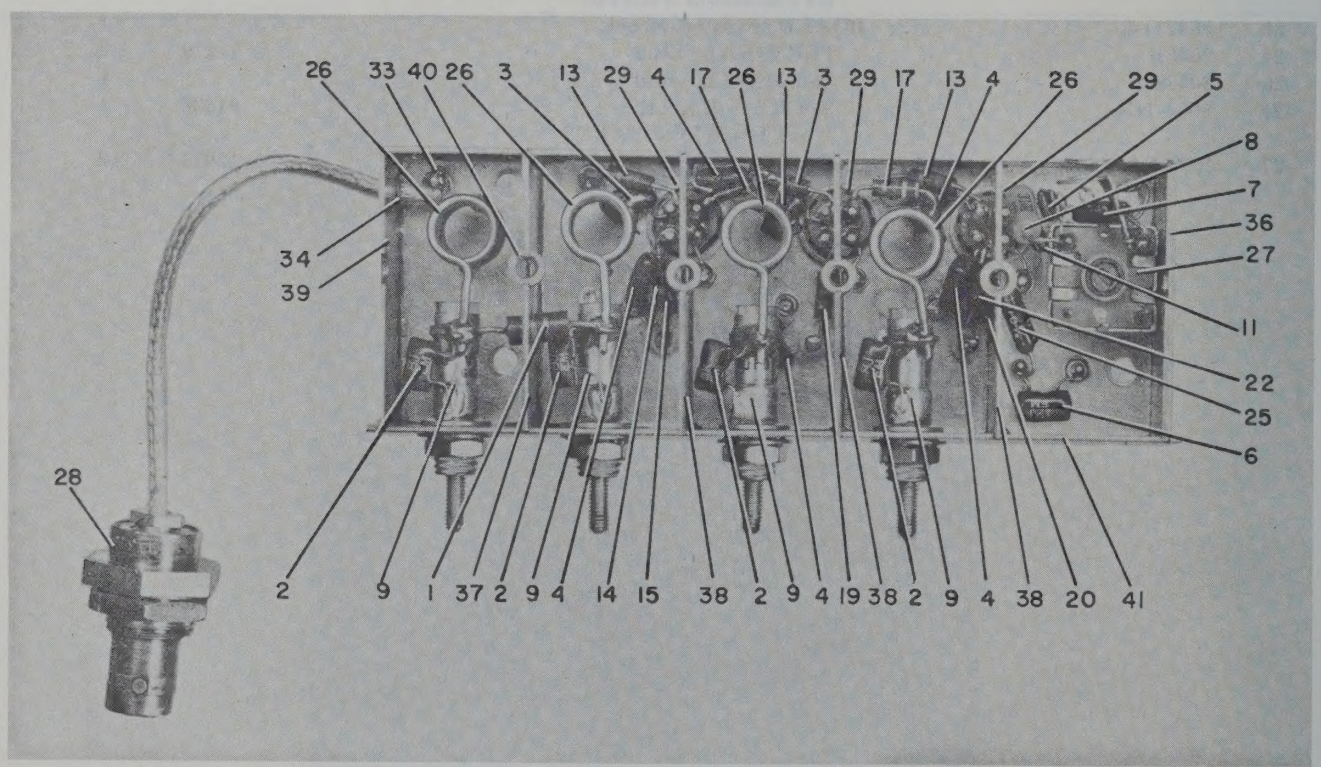




*Figure 5. Rf and Mixer Subassembly*

| FIG. AND INDEX NO. | MFR PART NUMBER | DESCRIPTION 1 2 3 4 5 6 7 8 9 | MFR CODE | UNITS PER ASSY | USE ON CODE |
|---|---|---|---|---|---|
| 5- | 117602-1 | . RF MIXER SUBASSEMBLY (see figure 1 for NHA) | | REF | |
| -1 | GAO-24PFPORM 5PCT | . . CAPACITOR, Composition, 0.24 uuf, 5%, 500 vdcw | 78488 | 1 | |
| -2 | DM10C080D0100 WV1CR | . . CAPACITOR, Mica, 8 uuf, 5%, 100 vdcw | 72136 | 4 | |
| -3 | DM10C680J0100 WV4CR | . . CAPACITOR, Mica, 68 uuf, 5%, 100 vdcw | 72136 | 2 | |
| -4 | DM10F241J0100 WV1CR | . . CAPACITOR, Mica, 240 uuf, 5%, 100 vdcw | 72136 | 6 | |
| -5 | DM10E750K0100 WV4CR | . . CAPACITOR, Mica, 75 uuf, 10%, 100 vdcw | 72136 | 1 | |
| -6 | DM10C560JP100 WV4CR | . . CAPACITOR, Mica, 56 uuf, 5%, 100 vdcw | 72136 | 1 | |
| -7 | DM10F201K0100 WV4CR | . . CAPACITOR, Mica, 200 uuf, 10%, 100 vdcw | 72136 | 1 | |
| -8 | 192P1030R8 | . . CAPACITOR, Plastic, .01 uf, 20%, 80 vdcw | 56289 | 3 | |
| -9 | VC1G | . . CAPACITOR, Variable, 1-9 uuf. | 73899 | 4 | |
| -10 | RC07GF561J | . . RESISTOR | | 1 | |
| -11 | RC07GF201J | . . RESISTOR | | 1 | |
| -12 | RC07GF101J | . . RESISTOR | | 1 | |
| -13 | RC07GF511J | . . RESISTOR | | 3 | |
| -14 | RC07GF562J | . . RESISTOR | | 2 | |
| -15 | RC07GF102J | . . RESISTOR | | 2 | |
| -16 | RC07GF202J | . . RESISTOR | | 1 | |
| -17 | RC07GF391J | . . RESISTOR | | 2 | |
| -18 | RC07GF302J | . . RESISTOR | | 1 | |
| -19 | RC07GF220J | . . RESISTOR | | 1 | |
| -20 | RC07GF621J | . . RESISTOR | | 1 | |
| -21 | RC07GF510J | . . RESISTOR | | 1 | |
| -22 | RC07GF272J | . . RESISTOR | | 1 | |
| -23 | 1N270 | . . SEMICONDUCTOR DEVICE, Diode, germanium | 80131 | 1 | |
| -24 | 1537-730 | . . COIL, Radio frequency, 68 uh ±10% at 25 mc, 240 madc; 2.5 ohms. | 99800 | 1 | |
| -25 | 1537-709 | . . COIL, Radio frequency, 1.2 uh ±10% at 7.9 mc. | 99800 | 1 | |
| -26 | 39029-1 | . . COIL, Radio frequency, 5 turns No. 16 AWG tinned copper wire, air core. | | 4 | |
| -27 | 39030-1 | . . COIL, Radio frequency, 9 ¼ turns No. 24 heavy nyleze wire close wound ccw on shielded coil form, slug tuned. | | 1 | |
| -28 | 025B3700-75 | . . CONNECTOR, Receptacle, BNC, bulkhead type | 94375 | 1 | |
| -29 | 5-4 | . . SOCKET, Semiconductor device | 06776 | 3 | |
| -30 | ST-SM-1 | . . TERMINAL, Stud | 98291 | 5 | |
| -31 | FT-SM-1L2 | . . TERMINAL, Feedthru, insulated | 98291 | 7 | |
| -32 | 117603-3 | . . CHASSIS ASSEMBLY, Radio frequency | | 1 | |
| -33 | X2043A | . . . TERMINAL, Stud | 71279 | 12 | |
| -34 | SE43 | . . . EYELET, Metal | 04264 | 1 | |
| -35 | 117603-2 | . . . CHASSIS ASSEMBLY, Radio frequency | | 1 | |
| -36 | 89778-1 | . . . . SHIELD, Radio frequency | | 1 | |
| -37 | 89778-2 | . . . . SHIELD, Radio frequency | | 1 | |
| -38 | 89778-3 | . . . . SHIELD, Radio frequency | | 3 | |
| -39 | 89778-4 | . . . . SHIELD, Radio frequency | | 1 | |
| -40 | 100930-1 | . . . . NUT, Plain, round | | 4 | |
| -41 | 80996-1 | . . . . CHASSIS, Electrical equipment | | 1 | |

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